ELECTRICAL REVIEW

21st AUGUST, 1953

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IN THIS ISSUE

For Information Only?	375
Bicycle Assembly	377
An End to Blinkers?	382
National Boards	386
Views on the News	387
Recent Introductions	388
Correspondence	390
Personal and Social	393
Non-Contact D.C. Ammeter	397
Nationalized Industry	401
Municipal Transport Results	403
Off-Peak Heating	404
Commerce and Industry	407
Singapore Power Station	411
Electricity Supply	415
The Nature of Power Stations	417
Financial Section	418
New Patents	422
Engineering in Europe	423
Contract Information	425
Classified Advertisements	121
Index to Advertisers	136

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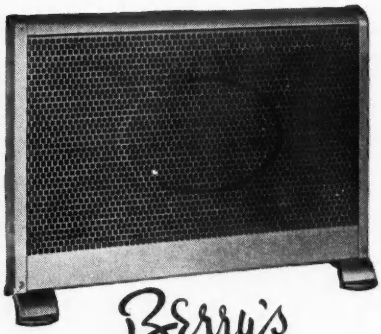

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ELECTRICAL REVIEW

21st AUGUST, 1953

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. 153 • NO. 8

For Information Only?

THERE has been a feeling among Members of Parliament that the existing means of keeping the House of Commons informed of the activities of the nationalized industries are inadequate. It has arisen to some extent from the desire of some Members that the House should be in a position to influence or control these activities. Conversely, it is also contended that the industries themselves are unable, under the present system, to put forward their views to the House and through the House to the public. Accordingly in November last a Select Committee was appointed to examine the subject and make recommendations. The Committee's report has now appeared and is reviewed in this issue.

The outcome of the investigation is a proposal that a House of Commons Committee should be set up to keep the activities of the national boards under constant review. The object would be to inform the House upon the aims, activities and problems of the boards and not, it is said, to control their work. The Select Committee recognizes that the affairs of the boards are far too extensive and complicated to enable the new body to deal with all of them annually and the appointment of sub-committees dealing with individual industries is proposed.

It is considered by the Select Committee that the general desire for information about the nationalized industries would be better met by the system now suggested than by existing methods. Reference is made to the "sheer volume and complexity" of the boards' annual reports which, in any event, may not contain what Parliament and the public want. But the industries are themselves large and complex; they already do their best to inform the public about their activities and it is not certain that information channelled through the proposed committee and its sub-committees would be more easily digested. Already the Press, which is in constant contact with the boards, does what it can to keep the public

informed broadly of what is going on. Lord Reith (as chairman of a public corporation), Mr. Herbert Morrison (a leading sponsor of nationalization) and Sir Geoffrey Heyworth (an industrial leader who is also a part-time member of the National Coal Board) were all against the Select Committee's recommendation. They feared that surveillance of this kind would impede the working of the industries, undermine confidence and cramp initiative. This is a view which we have always held: a commercial undertaking cannot be run in such conditions. Already the national boards are subject to the governance of Ministers who are answerable for them to Parliament and thus to the people. Anything more than this would inevitably have an adverse effect upon the boards and while the public might obtain much information, for which it has no use, it would certainly not get better service.

HOUSES FOR B.E.A. MEN

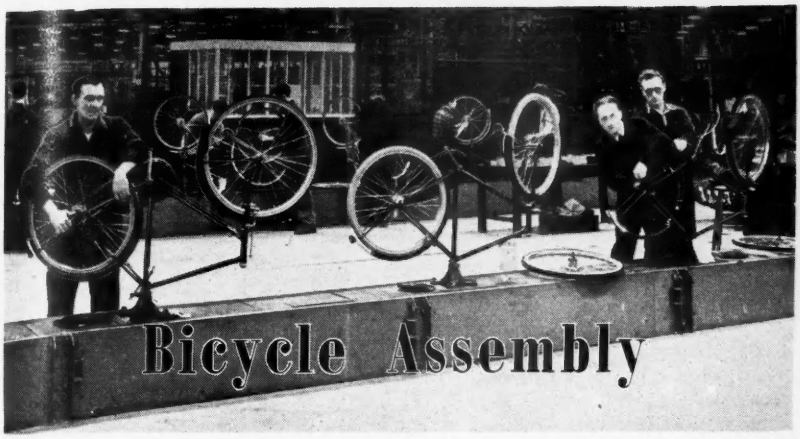
There has recently been some difference of opinion between the Bideford (Devon) Town Council and the superintendent of the East Yelland power station in the B.E.A. South Western Division. Some of the Council's new houses have been allotted to employees at the power station who have come from outside the area. The normal rent is 25s 6d a week, but this excludes a heavy subsidy and the Council sought to charge an " economic " rent of 38s. After discussion the Council agreed to make the figure 29s, but still the power station superintendent objected and ultimately a rent of 25s 6d was conceded. It may seem unfair that " foreigners " should enjoy a subsidy, but it is a fact that the power station will provide employment for local people and that, finally, seems to have weighed with the Council. This is a question which will arise fairly frequently as the British Electricity Authority goes ahead with the construction of its new generating stations. In one or two cases the Authority is itself providing the necessary housing for the power station staff.

NATIONALIZATION OF ENGINEERING

At last week's conference of the Confederation of Shipbuilding and Engineering Trade Unions the Labour Party's proposals for nationalizing certain sections of the engineering industry were considered to be hardly adequate and much more thorough-going action was advocated. There are, however, some doubts in other sections of the trade union movement about going so far or so fast. Wisdom lies behind these doubts for nothing could be more disastrous than the taking over by the State of manufacturing industries, particularly those contributing so largely to our export trade as the engineering industries. As we have said before, there may be a case for nationalizing basic commodities and services (though many have their doubts) but interference with the manufacturing side is quite another matter.

ELECTRIC FENCES

Wires electrified by battery operated induction coils, especially manufactured for the purpose, have proved effective in confining farm stock to their quarters. The shock administered is no more than disagreeable, since the current that can flow is negligible. Mains voltage, however, should never be used. The danger of doing so was demonstrated by the death reported last week of a smallholder in Caithness as a result of grasping a wire connected to a lighting circuit in the unfavourable conditions of a cow byre. The object of the connection was to prevent the straying of a bull, but cattle themselves are even more susceptible to fatal shock than human beings owing to the low resistance path between their tongues and the soft flesh within their hooves.



Bicycle Assembly

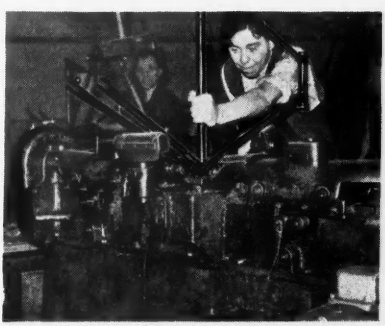
Electrical Installation at the New Raleigh Factory

APPLICATIONS of electricity to the production of the various components of bicycles made by Raleigh Industries, Ltd., at their works at Nottingham were described in our issue of 31st July (p. 353). To-day we propose to continue the story with a review of the electrical installation at the new 10 acre factory just being put into service there solely for assembly purposes.

The components are brought from the main factory into the assembly factory via a bridge on overhead conveyors. On arrival in the new premises they are taken to a stores section on the first floor whence they are issued as required on to a further conveyor system. As there are almost three hundred different basic models of bicycles made, each with many variations of specification, the programming of this issuing of stores is a highly complex business which has demanded a considerable amount of attention in order to obtain the correct sequence essential to secure a smooth flow of production.

Entering the assembly department, the frames pass to a small machine section where such operations are carried out as reaming, cutting the right and left hand threads in the bottom brackets for the ball races, and drilling and tapping various holes. The frames as well as the forks and mudguards then receive any decorative paintwork required in the form of lines, transfers and crests, the lining being put on by roller devices and the others by hand.

Continuing along the conveyor system the components are dried in a continuous hump-backed electric oven, thermostatically controlled in three zones by means of Cambridge regulators to give a maximum temperature of 180 deg F. With a total loading of 70 kW, the heating elements, which are of the 200 W high temperature fire brick type and are interchangeable, are fitted in two rows along the bottom of the oven, star-connected on the three-phase system. Incidentally the use of electricity for this drying operation is found to give



Cutting the left and right hand threads for the ball race in the bottom bracket

A comprehensive overhead conveyor system carries the components to and from the stores

much truer colours than was the case with gas previously tried. For the attachment of separate crest plates and similar operations use is made of 110 V 200 c/s hand drills.

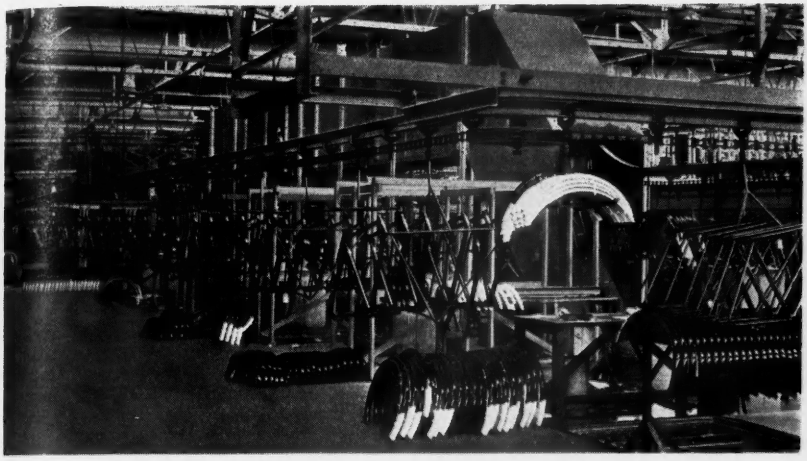
The above-mentioned components continue on the conveyor system, with other necessary components, to the assembly department. The bottom bracket axle complete with its bearings is then built into the frame and chain wheel and cranks fitted, after which the front fork is similarly fitted. The assemblies then make two returns to the stores to pick up first the mudguards and then, when these have been attached, the wheels, brakes and chains. For the fitting of these items the assemblies are transferred to slat conveyors. Back on overhead conveyors the assemblies receive such further components as handlebars, pedals, saddles, tool bags and pumps before being wrapped in protective guards and segregated into various types before packing and dispatch.

Bicycles intended for export are not generally supplied assembled, except for the United States, in which case they are individually packed in cardboard cartons before going into packing cases. Normally sets of components for twenty-five machines are packed in one case.

All the packing cases required are made on the premises with the aid of electrically operated machines which include a number of Wadkin circular saws and a pendulum saw which is found particularly useful for cutting the narrower boards. In the loading dock handling is facilitated by the availability of two 20 cwt Morris cranes which are provided with lock switches to prevent unauthorized use.

Throughout the new factory special attention has been paid to the provision of adequate and appropriate lighting, altogether 780 kW being required for this purpose. In these days of fluorescent lighting it is noteworthy that throughout the production areas tungsten fittings have been preferred, 1,900 B.T.H. dispersive units with 300 W lamps and 696 similar fittings with 200 W lamps being employed; in addition there are nearly 300 miscellaneous fittings. Fluorescent lighting is, however, utilized in the offices, fittings made by G.E.C. having been selected for the purpose. The lighting installation was carried out by W. J. Furse & Co., Ltd.

The main heating of the building is effected by means of a thermostatically controlled plenum system installed by J. Hughes & Co. (Heating), Ltd. Fresh air admitted at high level is blown through steam coils by seventeen Keith Blackman fans, driven by Woods of Colchester 3 h.p. motors, into seventeen ducts carried beneath the roof and distributed as factory conditions require. Extraction is via two 10ft by 6ft cable ducts in the floor by means

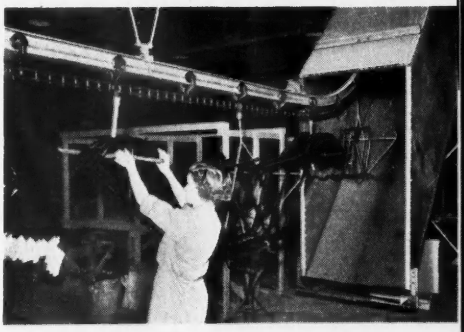


Frames, mudguards, etc., after decoration are dried in the electric oven seen in the rear

of four fans (5 h.p. motors). Fan heaters (Keith Blackman) are used for the lavatories.

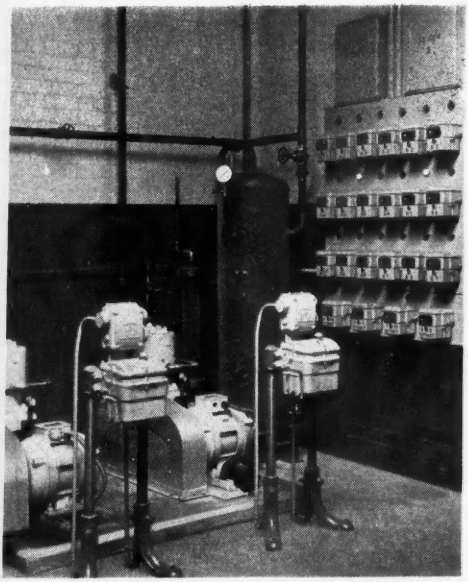
A new boiler house provided to supply the steam requirements both for this factory and also the nearby canteen and lamp factory is at present equipped with two Ruston & Hornsby "Thermax" boilers operating at a pressure of 175 lb/sq in and with an evaporative capacity of 12,000 lb/hr. A third similar unit will be added shortly. Two smaller boilers (6,000 lb/hr) are available for use in the summer for process work when space heating is not needed.

Bennis automatic stokers are provided, operated by Brook 1½ h.p. 3-speed motors with Allen West starters. The induced draught fans are driven by Metrovick



The entrance to the electric oven where components are dried after receiving decoration in the form of painted lines, transfers, etc.

High frequency tools are used for attaching crest plates and similar operations and (right) a pendulum saw is found particularly useful for cutting the narrower boards used for making packing cases



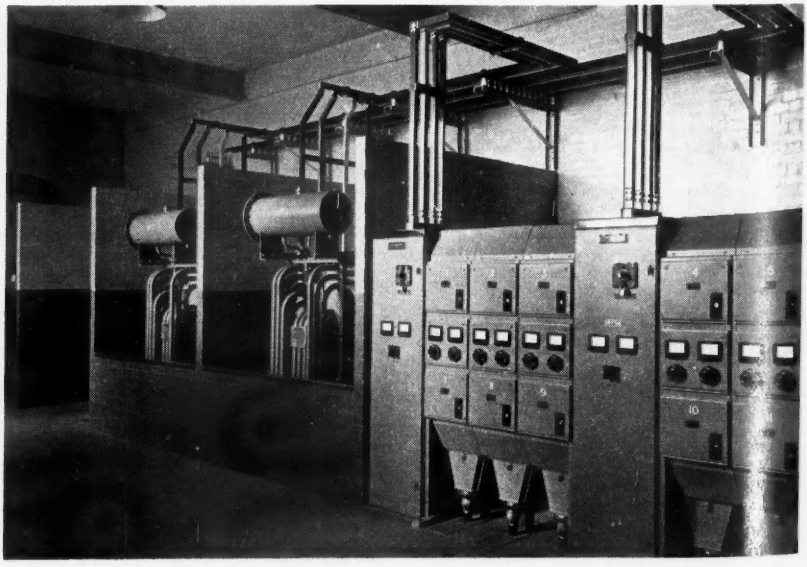
Duplicate pumps used for compressors and also the control switches for the plenum fans

variable speed slip-ring motors of 15 h.p. in the case of the larger boilers and 5 h.p. in the case of smaller units, control being by means of Ellison gear. A Cambridge CO_2 recorder is installed. Weir steam pumps normally supply water to the boilers but an electric unit driven by a 5 h.p. Metrovick motor is available as a stand-by. A Broom & Wade compressor driven by a 7½ h.p. G.E.C. motor supplies air for blowing up tyres and also for the plenum control. Incidentally all the plenum fan motors, as well as all other small motors in use in the factory, are controlled by Crabtree push-button starters.

In view of its importance provision is made to feed the boiler house from two substations, No. 6 in the lamp factory block and No. 7 nearby in the new factory. The latter substation, being the most recently constructed, is naturally the most up-to-date and incorporates many interesting features which the company's chief electrical engineer, Mr. R. Andrew, has found from experience to be desirable.

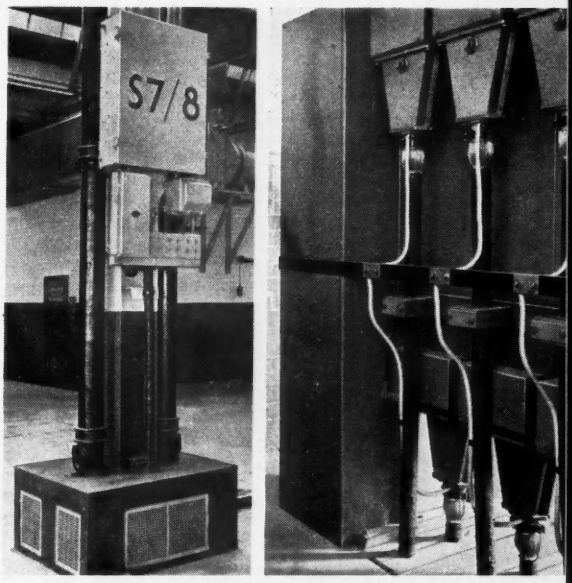
At present the substation is equipped with two Brush 11 kV/400 V transformers fitted with conservators and arranged for off-circuit tapping. Space has, however, been provided for a third similar unit and accordingly the necessary switchgear has

Transformers and low voltage switchboard in substation No. 7



already been installed. The h.v. switchboard is made up of Switchgear & Equipment 11 kV 150 MVA units with Landis & Gyr kVA and watthour meters. The Brush l.v. board comprises three 1,500 A isolating switches and twelve 300 A switches feeding 100 A English Electric distribution boards situated at convenient positions throughout the factory. Each distribution board is controlled by its own local switch fuse and is boldly marked with the numbers of the substation and switch to facilitate tracing of faults.

The method used to ensure bonding to earth throughout the installation is especially noteworthy, embodying separate cables taken from the main copper earthing bar to the entry glands of each switch. A feature of the busbar arrangements is the use of "Tufnol" stays between the bars. Fans in the substation are arranged to come into operation automatically should the temperature exceed 70 deg F.



One of the distribution boards with controlling switch fuse and local lighting switches: note the clear marking to assist tracing of faults. *Right:* **Method employed on the l.v. switchboard to ensure efficient earth connection**

The electricity supply to the substation is by means of a ring main of 0·2 sq in 3-core cable. Cable of 0·1 sq in section is used between the h.v. switches and the transformer, with 0·3 sq in cables feeding out into the factory. All the cable in the new building was supplied by Aberdare Cables, Ltd. It speaks well of the capabilities of the company's Electrical Department that it carried out the whole of the electrical work required throughout the works without having to call on the services of a consultant.

We thank the company for help in the preparation of these articles.

A.S.E.E. Inventors' Competition

THE Inventions Committee of the Association of Supervising Electrical Engineers, in collaboration with Dr. A. P. Thurston, M.B.E., adviser on patents to the Association, has awarded the Thurston trophy and prize of £10 to Mr. A. W. Pelerin, of Kingsbury, London, for his invention of a new design of tandem brush holder in the Association's inventions competition for 1952–53. Other entries received special commendation, including an electronic interval timer, entered by Mr. L. Middlemiss, of Leeds. The Thurston trophy and cheque will be presented to Mr. Pelerin by Mr. C. T. Melling, president of the Association, at the opening meeting of the London Lecture Session on 20th October at the Lighting Service Bureau, London, W.C.2.

The inventions competition is intended to encourage the inventiveness of members and the development of ideas of benefit to the electrical industry. Dr. Thurston has donated an annual cash prize of £10 each year for award with the silver-gilt trophy, which is held for one year by the winner, for the invention, new system, improved method, new design or other idea submitted and judged to be the most valuable contribution to the advancement of (*a*) the utilization of electricity, (*b*) the improvement of distribution technique, or (*c*) installation technique. The competition is limited to the membership of the A.S.E.E. Dr. Thurston remarked on the wide range of interests of the membership which the entries showed and said he felt that there must be many valuable and useful ideas possessed by members which should be entered for the competition.

An End to Blinkers?

Points for the I.E.E. Earthing Committee to Consider

By T. C. GILBERT, M.I.E.E.

THE investigation into earthing being undertaken by the Institution of Electrical Engineers is of fundamental concern to the industry, for of recent years the bias has shifted somewhat from protection against shock by direct earthing towards an uneasy suspicion that persistent earth leakage in inadequate earthing circuits may be responsible in part for an increasing proportion of electrically caused fires. Further, investigations by research bodies seem to show that it may even be impossible for direct earthing as practised to afford the desired level of protection in view of clearly-discerned changing conditions.

Shortcomings of Previous Reports

Most of the numerous earthing reports, by concentrating upon one aspect only of the problem, have confused rather than clarified the problem, failing to visualize the full impact of snap recommendations upon the wider field. The present writer, as a student of earthing problems and practices in this country and abroad, has had the temerity to criticize some of these reports, ranging from the pre-war "Practical Aspects of Earthing"—which was anything but practical—and the E.R.A. Report Ref. F/T102, "The Safety of Consumers in Rural Areas," which omitted reference to fault impedance except in connection with earth leakage circuit breakers, where it is of minor importance, to a recent Institution paper, which seemed to show that safety was obtainable only at excessive cost to the consumer.

In between there have been many others, such as E.R.A. Report Ref. V/T101, "The Electrical Resistance of Water Mains," published after investigation into conditions in Manchester and Rochdale following the insertion of cement-asbestos piping sections into a hitherto all-metal underground water supply network. This Report recommended the earthing of interior wiring installations to the service cable sheaths whilst at the same time retaining the metal water service pipe in parallel. This apparently overlooked the fact that, judging from the tables of recorded resistances in these areas, in all houses utilizing gas water heaters, where the gas and water services are metallically connected, the gas pipe becomes in effect the most important part of the earthing system by virtue of its generally lower resistance than either cable sheath or water service pipe. One other E.R.A. Report, Ref. V/T106, "The Cost and Efficiency of Protective Earthing of Low and Medium-Voltage Systems by Various Methods," dealt only with shock risk, leaving out of account fire risk. Mention should also be made of British Standard Code of Practice CP 321 (1948), "Electrical Installations, General," in which the recommended methods of protection against current leakage omitted all reference to regulation-approved and generally-accepted voltage-operated methods.

New Data Available

A really comprehensive review of the whole matter of earthing should result from the present investigation, in view of all the data and evidence available to the Committee. We now have the carefully tabulated figures regarding the incidence of fires caused by insulation breakdown prepared by the N.F.S. and Fire Brigade authorities, which were quoted by the Senior Electrical Inspector of Factories in a recent Institution paper. There is a whole library of annual Home Office Reports, based upon accident information available to factory inspectors, and indicating from direct observation the serious effects of persistent earth leakage and the extreme difficulty of ensuring adequate test and check of earth circuits and electrodes.

There is also an E.R.A. Report Ref.

V/T109, "The Incidence and Avoidance of High Resistance Joints in Steel Conduit Runs in Service," which seems to show that even with a high grade of labour, coupled with careful layout and expert supervision, it is very doubtful if 50 per cent of metal conduit runs can be relied upon to provide complete and adequate continuity over a number of years. On top of all this we have the increasing use of cement-asbestos piping in underground water networks, which removes the one fairly reliable electrode hitherto gratuitously afforded us.

That the Committee appreciates the complete picture is indicated by the quiet substitution in the current edition of the Wiring Regulations of previous reference to *resistance* of earth continuity conductors by *impedance*, a much-overdue change. Even so, we are without guidance as to how this factor is to be measured or calculated, although it is foreshadowed that methods of measuring impedances will be dealt with in a forthcoming E.R.A. report. Modern instruments which measure "loop" impedances by the injection of 8–10 A into the circuit are inadequate, for impedances in installations appear to vary widely with the magnitude of the testing current, and the "loop" may have to carry hundreds of amperes to effect isolation by means of overload devices. The writer's own experiments show that for an earth continuity conductor to exhibit no higher impedance than one ohm, the new Regulation requirement, the resistance must not exceed 0·2 ohm; this no doubt explains the recommendation in E.R.A. Report V/T109, mentioned above, that all new conduit runs, except those in excess of 100ft, should have a resistance limit of 0·1 ohm in place of the old one-ohm requirement.

All earthing reports to date, often quoted as authoritative, must be considered as obsolete in view of this new concentration upon impedance in the earth fault path; we can forget resistance in the future. Yet many electrical contractors and supply authorities still certify and accept new installations on the old resistance basis.

Protective Devices

Recent articles and Institution papers indicate a new approach to the protective problem, with the domestic installation treated differently from the industrial installation, with, in view of the generally better control of the latter, greater concentration upon the former. In this connection, in a paper which he presented to the Utilization Section, Mr. H. W. Swann, the Senior Electrical Inspector of Factories, described a core-balance protective device incorporating voltage response that must surely come nearer to the ideal than anything yet advocated for the domestic consumer. I doubt, however, if it will ever be possible to introduce a device costing, according to manufacturers who have seen a prototype, anything between £15 and £20, especially in face of present demands from architects and surveyors that the cost of electrical installations in small houses must be reduced. Even the present £35 per house, average, is considered to be too high, and costly protective devices can only result in there being less wiring to protect; even now the cutting-out of socket-outlets is being actively canvassed, and the writer has seen a wiring specification with the number of ring circuit socket-outlets cut from eight to five.

Wiring Costs

Are we to consider some compulsory adoption of safety devices? Unless so, it is useless to advocate them. This tendency towards saving costs on wiring is clearly visible in the Bailey Report, and from the safety aspect is definitely wrong; the omission of socket-outlets brings us back to the days of long trailing flexes, but is mentioned to show that any methods advocated for securing safety must be of low cost, more especially if they introduce something *new*. Much, however, can be done towards this desired end with only slight, if any, increase in wiring costs.

In the event of the technical excellence of these devices leading to their adoption, we could afford only one per house, installed at the main intake. Consumers should not be expected, however, to tolerate the extinction of all lighting, with risk of serious accidents, the stopping of clocks and other annoyances with the occurrence of an earth fault, possibly of minor importance —the boiling-over of liquids on to rings, for instance. Some sub-division of leakage protection is clearly desirable—it was available under the old methods of direct earthing, when it worked, by means of the final sub-circuit fuses; new methods should not involve a retrograde movement.

Whatever the form of earth leakage protection adopted it *must* be amenable to

easy test and check, and if not automatic at least almost so. The device mentioned above, and also the standard earth leakage circuit breaker, are provided with test keys, as both are delicate mechanisms and unless occasionally checked may be inoperative at the critical moment. These simple means of check are useless, however, unless they are used now and then, preferably almost unconsciously, by the consumer himself. It is doubtful if the check will be made sufficiently often if the device is fixed in some remote position, at the intake for instance, possibly in the cellar or in a cupboard full of brooms or other household clutter; it will certainly be avoided when the consumer finds that it stops his clocks. All forms of leakage protection are in the last resort dependent upon their earth connections remaining intact, and safety *cannot* be ensured by long-period tests involving instruments and skilled attendance.

Suggested Solution

Bearing all these points in mind, I suggest the following modifications to regulations covering domestic installations, with a view to securing a once-for-all solution to the protective problem:—

(1) Concentrate on all-insulated wiring systems for all domestic installations, so that the immediate requirement for a *central* protective device is avoided in cases where non-metallic water mains are laid. Tough rubber or plastic sheathed cables and non-metallic conduits can afford all wiring facilities required, whatever the form of construction—small houses or flats—and one-half of the problem has disappeared in company with a doubtful earth continuity conductor.

(2) Relax earthing requirements on lighting installations. The earthing of metal fittings in the centres of rooms is wasteful and futile, as is earthing of metal switchboxes covered by a moulded plate, but through which two small screws are just visible. Danger arises only with live metal that can be *grasped*; the possibility of pin-point contact on a possibly live screw can be ignored.

(3) Concentrate upon leakage protection for equipment and appliances in vulnerable situations, such as the cooker, washing machine and wash-boiler; there is no danger in bed- or sitting-rooms of small houses unless introduced in the form of earthed frameworks of radiators. Voltage-operated leakage trips, one incorporated in the cooker control unit (already available) and another covering the socket-outlets supplying other equipment, would serve the purpose. Co-operation of the housewife is not usually difficult to obtain, the test keys being used as the normal means of switching off; it is facilitated if the trip is fixed near the equipment it controls. Alternatively, the second trip could control a ring circuit, provided the washing machine or wash-boiler is connected to it.

(4) Earth continuity conductors should invariably be of copper, incorporated in the cable assembly for some systems and drawn into non-metallic conduits with the circuit conductors in others; they should be of the smallest size consistent with mechanical strength, say 3/·029 for *all* circuits, although 1/·044 is approved in Table 18. Requirements should be relaxed so that the sizes in this Table are applicable to non-metallic conduits as well as to cable assemblies.

Advocacy of voltage-operated devices will require some justification, and it is this—always in the background looms that elusive and unpredictable spectre, fault impedance. It seems quite useless to legislate as though all earth faults were dead, or of negligible impedance, as many occur at a point in small motor windings or heating elements. In small motor-driven appliances faults often occur at the brushes, holders or connections associated with them and, as the armatures are almost invariably situated between the field coils, one coil must always remain in the earth fault circuit; chokes in fluorescent lamps have the same effect, rendering isolation by means of fuses extremely unlikely, but intensifying the fire risk. It would seem that the possibility of high fault impedance must always stultify real protection by current-operated devices, whether fuses or circuit breakers.

Reliance on Leakage Voltage

Reliance should be placed upon the one factor certain to be present under all conditions—leakage voltage—and *nothing* else. It is, however, doubtful whether devices dependent upon the presence of the full mains voltage for their mechanical operation provide the complete answer, in rural areas especially. Commoner overhead line faults, such as short-circuit or the complete or partial loss of the neutral line in distribution or services, may result in

absence or considerable reduction of mains voltage on the consumer's premises, although a fault from the phase may persist. Leakage voltage, the factor affecting the safety of the consumer, whether against shock or fire, is *always* there in greater or less magnitude, and protective measures should be built round this realization.

Should fresh regulations emerge from the present investigation many installation engineers will hope for guidance on three main points; one, how to ensure adequate and almost automatic test and check of the protective circuit and equipment, with immediate indication of failure; two, the best way of tackling problematical fault impedance, which postulates the isolation of earth faults whilst still in the incipient stage; and, three, what methods of protection will guard a consumer against shock without introducing a fire hazard, possibly of greater importance; also, only *part* of the " loop " is under his control, and the high impedance section may well belong to somebody else. Fuller information about accidents would provide a more complete picture for the ordinary engineer.

These suggestions are offered in the realization that they will not achieve 100 per cent safety; this will lie along the lines already indicated in the current edition of the Wiring Regulations—reinforced or double insulation. This must not be confined to appliances and equipment, however, but taken into the wider field of wiring installations. Whilst this more logical solution of the problem is easily applicable to new wiring installations, we still have to consider the old ones, especially in those areas where a change to non-metallic water mains has taken place or is contemplated. Reinforcement of insulation is so easy with new plastic and synthetic materials that our future policy might well be confined to them.

Tariff Structure

A PAPER on " Limiting Factors in Tariff Structure," by Dr. Ing. B. Wehberg, originally read at Cologne University in 1949, has been reprinted with English and French translations (pp. 24; R. Oldenbourg, Munich). The paper falls into two parts, the first being a brief survey of the generally accepted facts and procedure in electricity supply costing and the second conveying certain suggestions of the author. The price of electricity is first shown as having an upper and a lower limit. The former is determined by the value of the supply to the consumer and is usually to be measured by the cost of some alternative which would give an equivalent service or an equal degree of satisfaction. In the case of industrial consumers, it is usually the cost of private generation, expressed in the two-part form of fixed and variable components.

The lower limit is the cost to the electricity supply undertaking. This cost is expressed on the basis of certain " Cost carrying units," these being the usual ones, namely, kWh, kW and (as regards distribution) number of consumers or number of meters. In making this analysis the author omits to point out that the two limiting values refer to *marginal* and not to *mean* values. As regards the allocation of the kW-related costs the author describes the normal peak-responsibility method and illustrates its application.

The author has no difficulty in pointing to serious flaws in the peak-responsibility method, and the second half of the paper is an endeavour to suggest something better. He presupposes a power station constructed to supply the needs of five hypothetical consumers and compares the costs of the combined enterprise with the costs they would severally incur if generating for themselves. He expresses the unallocated fixed common costs as a percentage of the total gain arising from combined operation, and he then proposes to use this percentage in assessing the allocation of each of the five consumers.

The method suggested is arbitrary in the sense that it does not attempt to represent the actual costs which result, but it might nevertheless result in an amicable division of the spoils (of combined operation) in the particular instance visualized. Unfortunately, the method does not seem applicable to the more usual situation of an already existing station, and for this the author suggests the " Capacity for bearing common costs " as a key for the allocation.

The method employed in this study, that of presupposing a number of component loads and examining effects of allocation thereon, is the same as that used in the E.R.A. Report K/T109: " An improved method for allocating to classes of consumers the demand-related portion of the standing cost of electricity supply." It cannot be said, however, that the suggestions represent any improvement on the E.R.A. solution, and its useful application would appear to be more limited in scope.—D.J.B.

NATIONAL BOARDS

Proposed Supervision by Parliamentary Committee

LAST November the House of Commons appointed a Select Committee "to consider the present methods by which the House of Commons is informed of the affairs of the nationalized industries and to report what changes, having regard to the provisions laid down by Parliament in the relevant statutes, may be desirable in these methods." The Committee nominated comprised Mr. Assheton (chairman), Viscount Hinchingbrooke, Sir Herbert Williams, Sir Patrick Spens, Col. Thornton-Kemsley and Messrs. Albu, Champion, E. Davies, Noel-Baker and R. Williams.

Committee's Recommendations

After hearing evidence from a number of witnesses, including chairmen of national boards, the Committee makes the following recommendations, contained in a Blue Book published last week (No. 235, H.M. Stationery Office, 4s):—

(*a*) There should be appointed a Committee of the House of Commons by Standing Order, to examine the nationalized industries, with power to send for persons, papers and records, power to set up sub-committees, and to report from time to time.

(*b*) The Committee should direct its attention to the published reports and accounts, and to obtaining further information as to the general policy and practice of the nationalized industries established by statute, whose controlling boards are wholly nominated by Ministers of the Crown, and whose annual receipts are not wholly derived from moneys provided by Parliament or advanced from the Exchequer.

(*c*) The object of the Committee should be that of informing Parliament about the aims, activities and problems of the corporations and not of controlling their work.

(*d*) The staff of the Committee should include an officer of the status of the Comptroller and Auditor-General who should be an officer of the House of Commons, with high administrative experience; at least one professional accountant, and such other staff as required.

(*e*) The statutory auditors of the corporations should, in preparing their annual reports, give such information in addition to that now provided by them as may be of use to the Committee and of interest to Parliament.

Mr. Hugh Molson (speaking for himself and not for the Government) favoured the appointment of such a committee as a means of enabling a few Members of Parliament to give intensive study to the problems and to interrogate witnesses and investigate papers and maps; and also to give comparative freedom from political prejudices in the seclusion of a committee room.

Lord Hurcomb (chairman of the British Transport Commission) and Sir Edward Bridges (Permanent Secretary to the Treasury) supported the principle, but arguments were advanced against it by Lord Reith (chairman of the Colonial Development Corporation) and Mr. Herbert Morrison. Lord Reith's view was that in setting up nationalized industries Parliament took from itself the right of direct interference, as with Government Departments, and the appointment of the proposed Committee would be contrary to that principle. Mr. Morrison did not think that Parliament was the kind of body to intervene on the "efficiency side" of a complex industrial concern. Moreover, constant inquiry into policy and operation would cause uncertainty in the industry as to where the ultimate decision lay and this might make "accountability" less rather than more secure.

Sir Geoffrey Heyworth, chairman of Unilever, Ltd., and a part-time member of the National Coal Board, also expressed doubts on the advisability of interrogation of members of the boards by the proposed Committee. The great public corporations, he said, had not yet had time to settle down as integrated bodies, but in due course they, like Unilever, Ltd., and other great commercial undertakings, would develop their own internal controls and their own adequate relations with the outside public.

"Confidant not Critic"

The Select Committee envisages the proposed body as proceeding in such a way that it will be regarded by the boards "not as an enemy or a critic but as a confidant, and a protection against irresponsible pressure, as well as a guardian of the public interest."

VIEWS on the NEWS

By REFLECTOR

IT has been said that some modern power stations are too like cathedrals and vice versa and that this should not be so. The Royal Fine Art Commission in its 1952 report deals with this point and its Johnsonian style is worth recording. In referring to " office blocks on the one hand, power stations and gas works on the other," it says:—

> " Their colossal size suggests a monumentality traditionally reserved for buildings of religious or other civic purpose. Neither office buildings nor power stations can claim high significance on an emotional plane."

In spite of this dictum, both lovers of modern power stations and their critics display a good deal of emotion at times.

* * *

I am told that the following cable was sent last week to the president of the Fédération Nationale de l'Eclairage et des Forces Motrices, Paris:—

> The Executive Council on behalf of membership of Electrical Trades Union of Great Britain sends warmest fraternal greetings of solidarity to members of Electrical Workers' Union of France. Congratulates them on the magnificent struggle with other French workers in defence of their living standards. Please also accept a donation of £1,000 to your strike fund as an expression of our lasting fraternal relationship."

While no doubt the E.T.U. is entitled to do what it likes with its money, I feel that a policy of non-intervention would have been preferable in view of the chaos which the strikes have caused.

* * *

A note in *Southern Electricity* describes experience with Wallaba poles for overhead lines in the Board's area. I had not previously heard of these; in fact, my first reaction on looking at the photograph with the wording " An inquisitive cow joins in the inspection of a Wallaba pole " was to wonder whether a kangaroo might not have been more appropriate. I have since discovered that the tree referred to is *Esperua falcata* which grows in British Guiana and North Brazil. The wood is very durable and heavy, sinking in water, for which reason poles made from it are not popular with linesmen. The article in the S.E.B. magazine mentions that the Ministry of Fuel and Power has recently accepted a recommendation by the Board, supported by the D.S.I.R., that a maximum bending strength of 13,000 lb/sq in may be used with Wallaba poles (cf. 7,800 lb/sq in for traditional Red Fir poles), making possible an appreciable reduction in diameter and enabling smaller poles to be used. Besides a saving in cost this also results in an improvement in the appearance of overhead lines.

* * *

Fish continue to provide hydro-electric authorities with extra-electrical worries. In Scotland the Hydro-Electric Board is under obligation to protect the salmon and trout in the waters which it uses. This apparently includes protection against these fishes' natural enemies, pike and perch. For two years (says the *Scottish Daily Express*) the Board has been trying to exterminate the pike and perch in Loch Luichart and in that period 3,000 of the former and 40,000 of the latter have been eliminated. Now their breeding ground has been traced and gelignite charges are being used against the piscine pests. The Scottish paper reports an engineer as saying that most of the dead fish will be too small for food but from previous " drives " 1,000 eels have been sent to England. Of course these must have been non-electric eels or there would have been protests from some Scottish quarters.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Automatic Electric Iron

THE latest addition to the range of household appliances manufactured by H. CASSIRER, LTD., 31, Pinner Road, Harrow, Middlesex, is the "Lincass 444" streamlined automatic electric iron. An improved design of the company's "direct action" thermostat, already in use in the ordinary "Safety" iron, is incorporated. The easy-grip, always cool, Bakelite handle has a left and right handed thumb-rest, and the low-angle bevel of the chromium plated sole plate enables it to slip easily under buttons and folds. The extra long flexible cord is provided with a rubber sleeve to prevent fraying and kinking. The iron weighs 4½ lb and is loaded at 750 W for all voltage ranges. A.c. models are priced at 39s 6d and universal patterns at 42s 6d.

"Lincass 444" automatic electric iron

Fires and Convectors

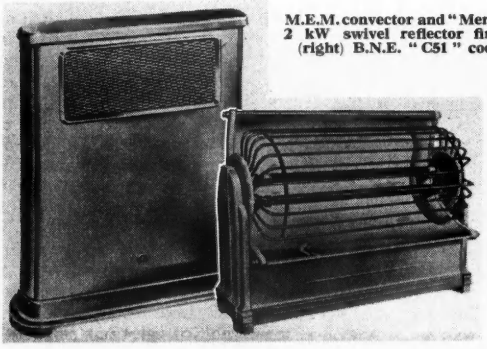
Several additions have been made to the range of reflector and panel fires and convectors produced by the MIDLAND ELECTRIC MANUFACTURING CO., LTD., Tyseley, Birmingham, 11. The attractively designed "Reflex" fixed reflector fire made in 1 and 2 kW sizes is available in mushroom or mottled stone finish. The "Memray" 1 and 2 kW swivel reflector fire is of robust cast construction with a polished reflector and is supplied either in bronze or cream.

For mounting directly on a wall, with or without surround, there is the 1 and 2 kW outset fire also available in mushroom or mottled stone. A new convector of a simple dignified design is attractively finished in bronze. Two ratings are available, with or without thermostats.

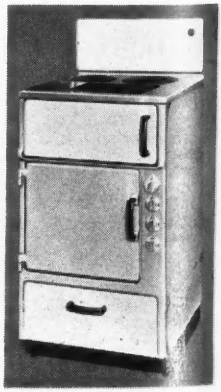
Improved Cooker

The "C51" cooker introduced late last year by BRITISH NATIONAL ELECTRICS, LTD., Charlton, London, S.E.7, met the demand for a low priced model that incorporated many of the most desirable features of more expensive cookers. The cooker has now been further improved by modifications to the main front frame to bring it flush with the floor, and to include a utensil drawer of ample dimensions.

The price of the standard 2-plate model, with drawer and fuses, is £29 4s, the 3-plate model costing £32. Simmerstats, radiant plates, etc., can be supplied at extra cost. When large quantity orders are concerned the company is



M.E.M. convector and "Memray" 2 kW swivel reflector fire and (right) B.N.E. "C51" cooker

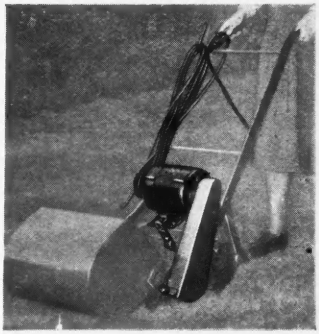


prepared to supply models without fuses and drawer units at reduced prices.

Lawnmower Conversion

A conversion kit designed to fit all the well-known makes of lawnmowers has recently been introduced on to the market by ALPHA MACHINES (TOOLS), LTD., Avenue Works, Gidea Park, Romford, Essex.

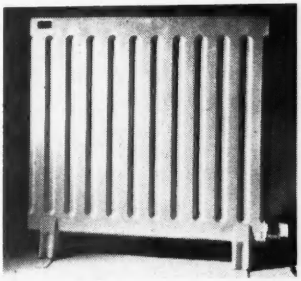
Each kit comprises a ¼ h.p. motor and universal fixing plate, belt adjuster, sets of pulleys, vee-belt and belt guard, cable clips and brackets, nuts and bolts, etc. The motor drives the cutting cylinder through a V-belt at a constant speed of about 600 r.p.m. and the makers claim that the unit can be fixed in thirty minutes. Each kit is provided with 60ft of three-core cable and costs from £12 13s 8d to £13 1s 8d according to the type of mower. Extra extension leads are available.



Alpha " Lawn Master " conversion kit

Portable Oil Filled Radiator

The new model TV½ portable panel radiator, brought out by HURSEAL, LTD., 229, Regent Street, London, W.1, retails at £8 19s 6d (plus £4 18s 5d purchase tax) and is claimed to be the cheapest oil filled radiator on the market. With a loading of 500 W, the radiator employs the patented Hurseal method of operation. A completely enclosed (and therefore completely safe) element heats a special diffusing oil sealed inside the radiator. As the oil retains the heat for a considerable time the radiator can be switched off during peak periods without undue discomfort.



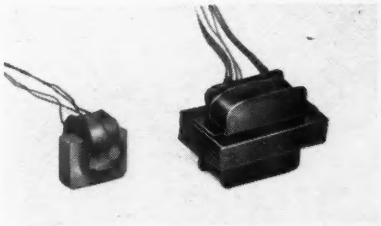
Hurseal TV½ portable panel radiator

Alternative Dry Shaver Pack

The Electrical Appliances Department of PHILIPS ELECTRICAL, LTD., Century House, Shaftesbury Avenue, London, W.C.2, says that from 1st September the new " Philishave " dry shaver will be available in an attractive leather pouch as well as in the imitation pony-skin case in which it is now supplied. The leather pouch is a more convenient travelling pack. For either pack, the price of the " Philishave " remains unchanged at £6 4s 11d (plus £1 4s 4d purchase tax in this country).

Transistor Transformers

Two sub-miniature transformers for use in transistor circuits are now being made by JOHN BELL & CROYDEN, 117, High Street, Oxford. The " O " type unit measures ⅜in by ⅜in by ¼in, and is an interstage transistor transformer or general coupling transformer. The inductance is 4 H at 0·4 mA over the normal audio-frequency band. The step-down ratio is 4·5 : 1 with a d.c. resistance of 870 Ω primary and 170 Ω secondary. It has a " Mumetal " core and can be supplied fitted with a screening can if required.



John Bell & Croyden transformers Type O (left) and Type A (right), actual size

The " A " type unit measures ¾in by $\frac{3}{16}$in by $\frac{7}{16}$in across the bobbin. It is an interstage transformer for matching a high-gain pentode to a transistor, and has a primary of 125 H at 50 μA. The step-down ratio is 30 : 1, the d.c. primary resistance 6,000 Ω and the secondary resistance 80 Ω.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

England-France Power Link

THIS country used to be the largest exporter of power in the form of coal. We are now importing coal from France and, it seems, will be importing electricity soon. The present interconnection with the Continent is labelled as "trial." Let us not fall into the trap of saving money by reducing expenditure on power stations and depending upon a supply from France as part of our essential supply. In time of trouble in France, a very unstable country, our economy will depend upon France's economy.

In time of war, which condition cannot be precluded, a cross-Channel line can easily be put out of commission. Similarly, the source of power can be rendered useless.

Bristol. A. H. McQUEEN.

"Are Qualifications Necessary?"

THE correspondence on this subject appears to have developed into the age-old controversy over the inadequacy of engineers' salaries. In case your readers feel that the claims of these correspondents are baseless, I would like to quote the official view of the Ministry of Labour and National Service as set out in its Handbook No. 17. This is intended as a guide to those about to choose their future careers and gives a detailed description of qualifications, training and prospects of employment as electrical engineers in all branches of industry. In Section 5, "Opportunities for Employment" (para. 2), the following appears:—

> "Considering the length and arduousness of the training required, engineering is not a career which offers particularly good financial prospects, except for the few who are outstandingly successful. It is work, however, which is seldom lacking in interest and which gives rise to very real satisfaction and a sense of accomplishment."

We can hardly blame the young men of this country for attempting to find a vocation which affords the advantages mentioned in the later sentences together with a reasonable remuneration for their efforts.

The B.E.A., Area Boards and manufacturers are complaining of a shortage of engineering graduates. The solution is in their hands.

Harrogate. K. NEWTON.

PRESUMING that Mr. W. S. Wilson (*Electrical Review*, 7th August) is an engineer, I cannot understand his outlook, all too common amongst engineers, of appearing to delight in belittling their profession. The present status of the profession is the result, and not in the supply industry only.

As is frequently the case, Mr. Wilson is not consistent in his argument. His first sentence agrees that the salary scales are "scandalous," but he ends by saying that they are generous, and then—most unkind cut of all!—that if he were negotiating, supply engineers would not fare so well.

I disagree with him that leading engineers of the industry are justified in speaking with two voices. The present shortage of technically qualified engineers—again not only in the supply industry—will continue until the young man who is willing to work can be assured of a status such as he would enjoy in medicine, law, or any similar profession. I see no reason why he should not expect this, for in the social system as it is developing, the qualified engineer has a public responsibility on a par with any other profession, and should be so rewarded.

Leading engineers who negotiate to get engineers on the cheap do their profession a disservice, and, though they may be "managerial" their attitude is the more to be deplored when, in the supply industry at least, the salaries paid to accountants, administrators, secretaries and the like—all "passengers" who have to be carried—seem to the engineer to be little short of fabulous. After all, the engineer is the one

who has to endure " the burden and heat of the day."

Nor is it surprising that there is dissatisfaction amongst the general public with the electricity service, for they have lost an engineering service, getting in its place an organization run by managers and administrators. With such supervision is it to be wondered that technical qualifications appear to be of little or no importance?

I have just seen the effusion of " Associate Member " in your issue of 14th August. I wonder why he bothered to obtain a qualification. Was he just as good an engineer without it?

CHARTERED ELECTRICAL ENGINEER.

Lamps for Street Lighting

MY purpose in engaging in correspondence concerning Mr. Pulvermacher's proposals regarding lamps for street lighting was to urge a completely objective approach to the problem rather than to advance the claims of any particular lamp.

Fluorescent lighting must be judged on its merits and here I must take a stand against Mr. Gostt on one issue only. He says that the visibility factor must be the first consideration for all roads except civic and shopping centres, promenades or public gardens. I exclude public gardens as outside the scope of this controversy but, for the rest, I should put visibility a very good first without any exception and I suggest that this is precisely where fluorescent lighting scores. Mr. Gostt advances the relatively low brightness of the sodium lamp as a major factor in its success. I advance the much lower brightness of the fluorescent lamp as its major recommendation and regard as secondary, but nevertheless very acceptable, the additional feature of favourable colour rendering.

Fluorescent street lighting is not a luxury for the favoured few, however, and this is my only issue with Mr. Gostt. On the contrary, it offers to the public at large the possibility of still better visibility at no greater cost than the old method.

London, N.6. W. ROBINSON.

Lamp Reversal

THERE is to the best of my knowledge no scientific support for the suggestion made in *Tit Bits* and referred to by " Reflector " in last week's *Electrical Review* that reversing the position of electric lamps in their sockets every three months will increase their life. On alternating current there is a reversal of polarity fifty times a second, so it is difficult to see how the direction of flow of current mentioned can affect the matter. My advice is, having installed the bulb, leave it alone.

London, W.C.1. W. J. JONES,
Director,
Electric Lamp Manufacturers' Association.

Cable Insulation Standards

PROPAGANDA at present being circulated by one side of the electric cable industry would lead one to believe that (to quote) " these new standards represent the culmination of extended and patient experimental work carried out over a period of years."

How far this body of opinion may be qualified to speak for the industry as a whole in respect of types of cable involved is a question for " patient thought " by the careful and experienced buyer. The question might possibly be asked what the other participants in the development of the standards were doing while they were being prepared for them.

Other people of long standing in the industry might ask, if such reduced dimensions are to-day the fashion, why in the war-torn years such reductions were not adopted in place of the reduction in rubber content. In those days, not only would we have saved the same amount of rubber (smoked sheet), but also a considerable quantity of ancillary raw material. Furthermore, one can be reasonably certain that, had such standards been then employed, they would almost certainly have remained, with a considerable saving of valuable dollars and short-supply materials, which gave so much trouble in the immediate post-war years and during the Korean crisis.

During the pressure of these war years p.v.c. came to be produced more generally and the great insulation of the future, polythene, was born. With the rise and success of the p.v.c. and polythene/p.v.c. cables and their very wide application and use for general purposes, one wonders how far their technical superiority and competitive production have been responsible for the reduction in dimensions of most standard rubber insulated cables.

As sure as the jet engine will replace the piston type, so the new and more modern types of cable will replace the older and what must always be the more costly type. The rubber cable manufacturers have received a blood transfusion but it only remains for the p.v.c. and polythene manufacturers to reduce the prices of the compounds, together with a sensible approach to thermoplastic cable and flexible dimensions, for the temporary advantage to be lost.

*Wandsworth, S.W.*18. W. L. WRAY,
Managing Director,
WANDLESIDE CABLE WORKS, LTD.

Jet Propelled

WHATEVER we electrical folk may think about the gas industry there can be no denying that it is jet propelled, a fact which may explain why it sometimes chokes and gets the needle!

Bournemouth. W. E. WARRILOW,
M.I.E.E.

Water Heater Hire Purchase

ALL water heaters are to be exempted from the provisions of the Hire Purchase (Control) Order from to-day, 21st August. Hitherto anyone buying a gas or electric water heater on hire purchase terms has been required to pay a minimum initial deposit of 33⅓ per cent and to pay off the balance in not more than eighteen months. This step has been taken as part of the Government's measures for improving fuel economy. As the Ridley Committee stated, the use of gas and electricity requires less coal than solid fuel appliances do in providing summer or occasional hot water supplies for the average household. The wider installation of these appliances is therefore expected to assist in the saving of coal and in general fuel economy. The Order giving statutory effect to this relaxation of control is the Hire Purchase (Control) (Amendment No. 4) Order, 1953 (S.I. 1953 No. 1264, H.M. Stationery Office, price 2d).

Snowy Mountains Project

EXPENDITURE of a further £14 million is planned for the Snowy Mountains hydro-electric scheme in the current financial year and it is believed that the Federal Cabinet will examine this proposal during its coming Budget discussions. Last year the Federal Government spent £13·6 million on the scheme, bringing the total expenditure to about £32 million.

Three Japanese electrical manufacturing companies are trying to secure a contract for the supply of generators worth about £15 million to the Snowy Mountains Authority. It is pointed out, however, that the import duties on Japanese generators would be much heavier than those on British. The companies concerned are the Mitsubishi Electrical Co., the Toshiba Co., and the Hitachi Co.

A large Italian hydro-electric firm has expressed its intention of tendering for the next major section of the Snowy Mountains scheme —the construction of a 14-mile tunnel, the Tumut Pond dam, and another tunnel connecting the dam to the power station. The cost of the work is expected to be about £60 million.

Electricity in Trinidad

THE revised estimate for the island-wide electricity scheme in Trinidad is $18 million. This scheme is one of the important projects included in the five-year economic programme for the years 1950–55. It is estimated that up to the end of 1954 about $9 million will have been spent. Revision and expansion of the scheme has been found necessary to meet consumer demands.

The first stage of the scheme has just been completed, a 5 MW turbo-alternator having been put into operation at Penal in south Trinidad. Three sets, two of 5 MW and one of 20 MW, are to be installed at this point.

Trinidad's expanding programme of power generation should mean a corresponding increase in the demand for many kinds of electrical goods. Last year total imports of electrical machinery, apparatus and appliances were valued at $6,170,000, an advance of $1,371,000 on the previous year. Of these, motors, transformers, etc., from the United Kingdom represented $1,147,000 or nearly 50 per cent more than in 1951.

Electricity generation and distribution by public utilities in 1952 totalled over 71 million kWh, of which it is estimated 20,366,000 kWh was for domestic use, 9,668,000 kWh for commercial use, 23,824,000 kWh for industrial use and 1,340,000 kWh for street lighting. The corresponding total for 1951 was about 62 million kWh.

Industrial Coal Consumers

THE Minister of Fuel and Power, after taking into account recommendations from bodies representative of the interests concerned, has reconstituted the Industrial Coal Consumers' Council for its third term of office, ending in July, 1956. Sir Ernest Smith, C.B.E., who has been chairman of the Council since its formation six years ago, has been reappointed to that office, and Mr. H. T. Norton, ex-chairman of the South Wales Coal Exporters' Association, has again been appointed deputy chairman.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Minister of Transport has appointed **Gen. Sir Brian Robertson,** Bt., G.C.B., G.B.E., K.C.M.G., K.C.V.O., D.S.O., M.C., to be chairman of the British Transport Commission in succession to Lord Hurcomb, G.C.B., K.B.E., whose term of office expires on 31st August. He will take up duty as soon as the negotiations with Egypt have reached a sufficiently advanced stage. The Secretary of State for War has agreed to release Sir Brian Robertson from the post of Adjutant-General to which he was recently appointed.

Lord Hurcomb, a former chairman of the Electricity Commission, has been chairman of the British Transport Commission since 1947.

Two changes in representation on the Electrical Fair Trading Council have recently occurred :—**Mr. C. J. W. Scott,** an executive director and general sales manager of Crompton Parkinson, Ltd., and chairman of E.L.M.A., now represents E.L.M.A., in place of Mr. N. V. Everton. **Mr. W. T. Trace,** immediate past-president of the E.C.A. and allied associations, now represents N.E.C.T.A., in place of Mr. T. E. Alger who has been on the Council since its inception in 1933.

Mr. H. A. Springer, A.M.I.E.E., contracts manager with Sangamo Weston, Ltd., has been appointed to the board. Mr. Springer joined the company in 1932 and after holding various positions in the Production and Contracts Department was appointed contracts manager a year ago.

Mr. H. A. Springer

Mr. J. W. Cuthbertson, A.M.I.E.E., D.Sc., has been elected president of the Institute of Metal Finishing for 1953-54.

The directors of Submarine Cables, Ltd. (owned jointly by Siemens Brothers & Co., Ltd., and the Telegraph Construction & Maintenance Co., Ltd.), announce the appointment of **Mr. W. G. Patterson,** M.B.E., M.I.I.A., deputy managing director of Siemens, to the board of Submarine Cables, Ltd., in place of **Mr. S. W. Lumb,** F.A.C.C.A., secretary of Siemens, who has been appointed an alternate director to Mr. Patterson.

Mr. John Ayres, M.I.E.E., M.I.P.E., F.I.W.M., until recently managing director of Petters, Ltd., Staines, and general manager of J. & H. McLaren, Ltd., has been appointed a director and general manager of Simms Motor Units, Ltd., with which he was general works manager during the war years. Mr. Ayres, who is well-known in industry as an authority on factory management, on which subject he is a lecturer and a visiting specialist to the Demonstration Staff College, Henley, has been given the responsibility of organizing a summer school, now in session, at Worcester College, Oxford University, to study some of the problems of industry. He received his training with the General Electric Co., Ltd., and the Highfield Electric Co., being manager of the latter from 1932 to 1935. From then until 1938 he was chief engineer and manager of the Electrical Division of Bryce, Ltd., subsequently joining Simms Motor Units as chief electrical designer and becoming general works manager. From 1945 to 1950 he was works director with the Brush Electrical Engineering Co., Ltd.

Mr. John Ayres

Miss O. M. Forbes, M.B.E., retired from the position of lady superintendent of welfare and women's employment with Ferranti, Ltd., at the end of July. To mark the occasion Miss Forbes was presented with a television receiver and a cheque on behalf of her friends on the staff and in the company's works. Sir Vincent de Ferranti, chairman and managing director, supported by Lady Ferranti, Mr. Sebastian de Ferranti and his wife and several executives of the company, made the presentation at a large assembly of members of the staff and works employees.

Mr. J. E. Brown has been appointed lecturer in electrical engineering in the University of Bristol, to specialize in electrical machinery and plant. Mr. Brown

was educated at King's College, Newcastle-on-Tyne, and the University of Sheffield. He has had many years practical training and experience with the R.A.E., Farnborough, the English Electric Co., Ltd., and Crompton Parkinson, Ltd. He was joint author of a recent I.E.E. paper on "A General Method of Analysis of Three-Phase Induction Motors with Asymmetrical Primary Connections."

Mr. E. Fedder, A.M.I.Mech.E., A.M.I.Prod.E., has been appointed general manager of the British Switchgear Corporation, Ltd., Morden, after relinquishing his post as works manager of the Emco Brass Manufacturing Co., Ltd. Mr. Fedder's earlier career was spent in the electrical switchgear and electronics industry where, during thirteen years, he gained extensive experience in production and administration.

Mr. L. M. Squires has been appointed manager as from 1st September of Dormor & Co., Ltd., wholesale electrical suppliers, of Boscombe, Hants. Mr. Squires was formerly with the Southern Electricity Board at High Wycombe and has been connected with the electricity supply industry for the past thirty years.

Dr. W. T. Stiles, O.B.E., of the National Physical Laboratory, is to present a paper at the New York conference of the American Illuminating Engineering Society on 14th September.

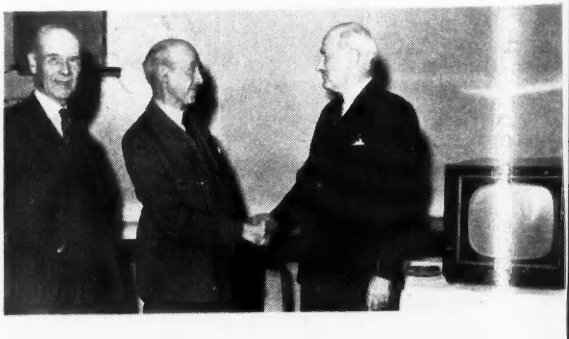
Mr. E. C. McKinnon, M.I.E.E., terminated his service with the Chloride Electrical Storage Co., Ltd., on 31st July after just over sixty years' continuous employment. Mr. McKinnon was for many years chief engineer of the Chloride Electrical Storage Co. (the name of the manufacturing company was later changed to Chloride Batteries, Ltd.), after previously being draughtsman, chief erector and head inspector, which involved tours of Russia and Scandinavia. During the 1914-18 war he made protracted visits to Russia and Latvia in connection with the large fleet of British submarines in which storage batteries supplied by the company were installed. Mr. McKinnon is a past-chairman of the North Western Centre of the Institution of Electrical Engineers. He has read two papers before the I.E.E., and for one of them he received an award. He served for three years on the International Electric Standardization Committee. His book "The A.B.C. of Storage Battery Management" has had world wide circulation.

Mr. G. C. R. Eley, C.B.E., M.A. has been appointed deputy-chairman of the Brush Electrical Engineering Co., Ltd. Mr. Eley is chairman of British Drug Houses, Ltd., a director of the Bank of England, etc., and is also a member of the London Electricity Board. **Major Noel E. Webster,** O.B.E., M.C., president-elect of the Institution of Mining Engineers, has been elected a director of the Brush Co. He is a member of Lloyds and a director of a number of companies.

Mr. H. B. McAuslan has been appointed resident representative of the Brush group in India, Pakistan and Burma, and will be travelling to India to take up his new duties at the end of this month. He has been made a director of Associated British Oil Engines (Export), Ltd., National Oil Engines (Export), Ltd., and Brush Export, Ltd. Mr. McAuslan joined the National Gas & Oil Engine Co., Ltd., as general sales manager in 1950, and since 1952 he has been a director of Associated British Oil Engines (Marine), Ltd.

Mr. A. L. Cramb, M.I.E.E., has been appointed manager in India and will be responsible for the branch office of the Brush Electrical Engineering Co., Ltd., with the status of a local director (in India). He remains a director of Brush Export, Ltd. Mr. Cramb joined the group in 1946 as technical manager in India for the Brush Electrical Engineering Co., Ltd. In November, 1950, he became sales promotion manager in India, Pakistan, and Burma for Brush Power Engineering and in July, 1951, he was appointed representative in India, Pakistan and Burma for the Brush group. Mr. Cramb was apprenticed at the Trafford Park Works of the Metropolitan-Vickers Electrical Co., Ltd.

Mr. A. W. Browne, O.B.E., M.I.E.E., chairman of Chloride Batteries, Ltd. (right) presenting Mr. E. C. McKinnon with a television set upon his retirement. On the left is Mr. W. S. Naylor, director and past-chairman



and spent a further three years with the company as a junior erection engineer on turbine, large transformer and switchgear erection. In 1939 he joined the Royal Navy as an engineer officer and served mostly at sea until demobilization in 1946.

In our issue of 26th June we published a photograph taken during the Convention of the **Association of Municipal Electricity Undertakings of Southern Africa.** Mr. J. C. Fraser, general manager of the Johannesburg Electricity Department, who is on the left of the picture, tells us that next to him is Mr. H. Miller, Mayor of Johannesburg, and not Dr. W. Nichol, Administrator of the Transvaal.

Mr. E. Russ has beeen appointed sales and contracts director of Bell & Webster, Ltd., makers of pre-cast concrete units for the building and electrical industry. Mr. Russ was previously with Concrete Utilities, Ltd., and before that with the British Thomson-Houston Co., Ltd.

Mr. J. Fisher, M.I.E.E., at present superintendent of the Bath power station, has been appointed deputy superintendent at Portishead "A" power station in succession to **Mr. A. G. Amey,** who is retiring after thirty-four years' service in the electricity supply industry.

Mr. R. B. Pearson, A.M.I.E.E., A.M.I.Mech.E., has been appointed superintendent of Blackburn Meadows power station. He will be taking up his new duties in the near future. Mr. Pearson is at present employed as station superintendent at Barugh, Barnsley and Wakefield power stations, and he was previously at Huddersfield, Deptford East and Blackburn Meadows.

Mr. A. E. J. Walker, A.M.I.E.E., has been appointed sales manager to British Electric Lamps, Ltd., in succession to **Mr. A. F. Brown,** who recently resigned for health reasons. Mr. Walker was previously with Newey & Eyre, Ltd., and Birmingham branch manager for Siemens Electric Lamps & Supplies, Ltd.

Mr. G. L. Hunter, B.Sc.(Hons.), Graduate I.E.E., has been appointed as an assistant engineer with Roan Antelope Copper Mines at Luanshya, Northern Rhodesia, and sailed last week in the s.s. *Pretoria Castle.* He is the younger son of Mr. N. Hunter, M.I.E.E., of the North Eastern Electricity Board.

OBITUARY

Alderman C. F. Sanderson, a member of the North Eastern Electricity Board, died on York on 11th August. Alderman Sanderson was a senior official of the National Union of Railwaymen, a member of York City Council and a former Sheriff of York.

Mr. E. B. Bull.—The death is announced of Mr. Edward B. Bull, O.B.E., founder and managing director of Welwyn Electrical Laboratories, Ltd.

Mr. L. A. Woods, senior representative of the Edinburgh Branch of the General Electric Co., Ltd., died on 13th August. He had been with the G.E.C. for over thirty-one years.

Mrs. G. A. Juhlin.—The death occurred on 15th August of Mrs. Kathleen Juhlin, the widow of Mr. G. A. Juhlin, M.I.E.E., a former chief electrical engineer and director of the Metropolitan-Vickers Electrical Co., Ltd., who died in December, 1951.

WILLS

Mr. W. G. Rainbow, of London, N.W.3, electrical engineer, who died on 30th March last, left £5,615 gross (£5,570 net).

Mr. K. N. Hatton, of Fareham, Hants, electrical engineer, who died on 22nd May last, left £2,784 gross (£2,108 net).

Mr. E. H. Lay, a member of the British Thomson-Houston Co.'s sales staff, who died on 2nd May, left £7,675 gross (£7,213 net).

Mr. W. H. Ayres, governing director of Refrigeration Services, Ltd., who died on 20th November last, left £47,847 gross (£43,524 net).

Mr. D. M. Henshaw, chairman of W. C. Holmes & Co., Ltd., etc., who died on 6th February last, aged sixty-nine years, left £41,952 gross (£37,404 net).

Mr. J. W. H. Livett, chief of technical sales (switchgear) to Johnson & Phillips, Ltd., who died on 31st January, left £7,509 gross (£7,464 net).

Mr. H. Sanderson, electrical wholesaler, of Levenside, Stokesley, Yorks, who died on 17th May, left £28,345 gross (£27,241 net).

Mr. F. H. Starling, M.I.E.E., chairman of Blackburn, Starling & Co., Ltd., who died on 26th January, left £60,067 gross (£58,939 net).

Electrical Engineers' Exhibition

THE Exhibition Organizing Committee of the Association of Supervising Electrical Engineers announces that the third Electrical Engineers' Exhibition will be held at Earls Court, London, from 16th to 20th March next. In deciding that the exhibition shall be a five-day event, the Committee has been guided by the consensus of opinion expressed by manufacturers and other intending exhibitors. It has also been decided that exhibition hours are to be the same as on the last occasion, viz. 10 a.m. to 7 p.m.

As bookings of space already exceed those made for the last exhibition the Committee is drawing up fresh plans so that all applicants for space shall be accommodated.

TROLLEY MINING LOCOMOTIVES

Experimental Installation in a Lancashire Colliery

THE first underground trolley locomotive installation to operate in a British coal mine started last month in the South Tunnel at Sandhole Colliery, Lancs, over a distance of 1½ miles, the average gradient being about 1 in 100 in favour of the load. A substation is provided at about the mid-point, equipped with two 120 kW mercury arc rectifiers (one to act as a spare) together with transformers and a.c. and d.c. switchgear. The incoming supply is at 2,000 V three-phase 50 c/s and the supply to the overhead trolley line at 250 V d.c.

The overhead line is carried on cross-span suspension wires and is divided into 500 yd sections in accordance with regulations. The return path is by means of 60 lb/yd F.B. track rails which have a special design of bond accommodated behind the fishplates; a short section of track has been solidly welded for test purposes.

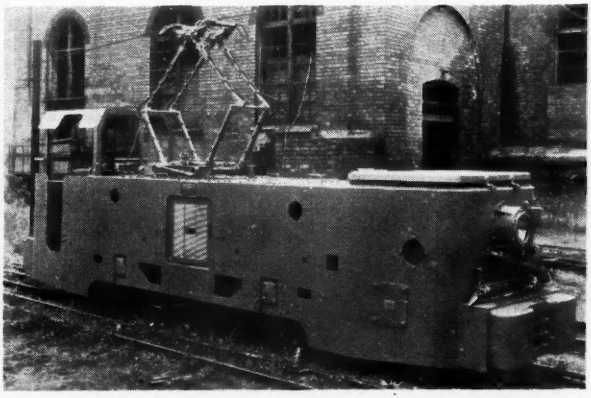
The two-axle locomotives weigh a little over 8 tons each, equipped with two axle-hung traction motors driving through single-reduction spur gears; each locomotive has a one-hour rating of 62 h.p. Current collection is by means of a pantograph with a double collecting pan. Contactor control has been provided and the auxiliary equipment includes a motor driven blower for cooling the traction motors and an air compressor for the braking equipment. Straight and emergency air and hand brakes are fitted so that the locomotives can be used to haul air-braked man-riding cars as well as unbraked trains of mineral. The locomotives haul trains of 70 tubs at speeds up to 12 m.p.h. and the initial stages of operation have proved that they are more than capable of this.

Two inherent limitations in the design of the installation had to be accepted, since any change would have necessitated such extensive alterations to the remainder of the colliery installation that they could not be contemplated. These are the gauge, which is 1ft 9½in, and the rolling stock, which is made up of small tubs of less than one ton gross weight each.

Particular care has been taken to incorporate every reasonable safety device. The locomotives have the usual interlocking of driving and reversing handles which makes it almost impossible for them to be misused, and a "deadman's" feature, blower warning light and no-volt and overload protection are provided. In addition, a special air-operated switch enables the driver at once to cut off power from the overhead line in an emergency wherever he may be. There is also a safety trip-wire along the side of the road by which power can be cut off at the substation. An earth leakage wire is carried on the cross-span wires so that leakage current from the overhead line will operate a relay in the substation, cutting off the supply. Special warning lights and trip levers are installed at each end of the system so that if a locomotive is inadvertently driven too far power is cut off and the brakes applied.

The main contractors for the locomotives, substation equipment and switchgear were the Metropolitan-Vickers Electrical Co., Ltd., with E. E. Baguley, Ltd., as sub-contractors for the construction of the mechanical parts of the locomotives. The main contractors for the overhead equipment and bonds were the Liverpool Electric Cable Co., Ltd., with Wiseman & Co., Ltd., as the main sub-contractors. Signalling equipment is being installed by MV-G.R.S., Ltd.

One of the main objects of this installation is to see if trolley locomotive haulage is economic when the necessary safety precautions have been taken and the requirements of the Chief Inspector for Mines have been complied with.



Underground trolley locomotive for Sandhole Colliery, Lancs

Non-Contact D.C. Ammeter

The Design of a Remote Indicating and Recording Instrument

By W. H. BAILEY, B.Sc.(Eng.)

THE measurement of the d.c. or a.c. flowing through cables by instruments making use of the magnetic field surrounding the cable has been common practice for many years. Several types of hand-held meter are available in which a split magnetic yoke is used to direct the flux and apply it to a moving-iron movement. The force so obtained, however, is not sufficient to operate a recorder, and it is not possible to use the meter away from the cable as in the case of a shunt-connected ammeter. To overcome these limitations the British Iron and Steel Research Association has designed a transmitting and transforming device which enables an ordinary moving-coil indicating or recording meter to be used at any distance from the cable.

The device, in the form in which it has been made up and tested, is shown in Fig. 1. The yoke, A, built up of transformer iron laminations, is in two halves which can be separated at B and are joined together at C by hinges, the axes of which coincide with the axis of the armature tunnel, D. This enables the yoke to be placed, without disconnecting it, around the cable E, in which the current is to be measured. The armature, F, has a cylindrical centre portion and a sector-shaped pole piece at each end, these pole pieces being at 180 deg to one another. The armature is rotated at constant angular velocity by the synchronous motor, G, which is driven from a constant frequency supply. Any other source of power, such as a spring motor, could be used. A stationary coil, H, surrounds the centre portion of the armature.

As with other meters, the operation of the device depends on the fact that there exists around a cable carrying a current a magnetic field whose strength is dependent upon the magnitude of the current. This field induces a corresponding field in the yoke and the action of the rotating armature is to pass it alternately in one direction and then in the other through the coil, in which an alternating e.m.f. is thus induced. The magnitude of this e.m.f. is proportional to the strength of the field passing through the coil and it can be applied to an indicating or recording voltmeter which need not be situated near the transforming device.

Operated as above, no indication of the direction in which the current in the cable is flowing is obtained. However, where an indication of polarity is essential, the provision of coil J, through which a constant polarizing current is passed, enables meters with centre-zero scales to be used. The meter movements are of the side-zero type, and the current through J is so adjusted as to bring the pointer up to the zero of the scale when the current in the cable is zero. The pointer will then move to the right or left as the magnetomotive force of the cable current aids or opposes that of the

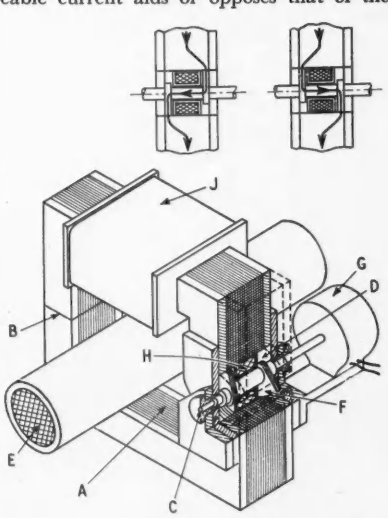


Fig. 1.—General arrangement of the transmitting and transforming device

polarizing coil. By appropriate setting of the polarizing current the pointer may be set to zero at any other position on the scale, so enabling the positive and negative full-scale readings to be chosen to suit the respective magnitudes of the positive and negative currents.

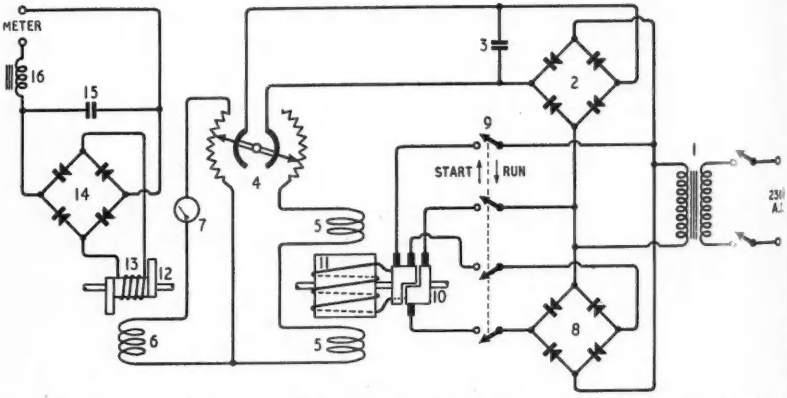
The motor which drives the armature F was specially made as inquiries revealed no commercially available machine which appeared to be suitable for the purpose. It has a two-pole field system excited by d.c. and a two-pole armature of the shuttle, or H, type connected to a unit in which a two-part commutator and a pair of slip-rings are combined. The armature shaft is carried in a ball bearing at the commutator end and on a spigot projecting from the generator shaft at the other end, the generator rotor shaft running in two ball bearings of which the outer races also act as hinge pins. Torque is transmitted from the motor to the generator by a flexible coupling so that alignment of the three bearings is not critical. There is a flywheel on the rotor shaft at the end remote from the motor.

A d.c. supply is connected across the commutator brushes for starting but is disconnected when the armature has run up to something over 3,000 r.p.m. and a 50 c/s supply is immediately connected across the sliprings. The machine pulls in when the speed falls to the synchronous value. The change-over is made by a pair of double-pole single-throw switches which are so coupled that both cannot be closed together. Although a two-pole motor is not considered to be self-starting, this 24 V machine rarely fails to start unaided, a feature obtained by the suitable placing of the axis of commutation with respect to the magnetic axis.

A " power pack " provides the two d.c. supplies and the a.c. supply from 230 V a.c. mains. It is intended that the d.c. supply for the field should also be used to supply the biasing coil and in the same box as the power pack is a rectifying and smoothing circuit for the generator output so that existing d.c. recorders can be used. Fig. 2 shows the power pack, biasing and output rectifying circuits for one unit and Fig. 3 is a photograph of the complete equipment. The power requirement is about 30 W but this could be reduced considerably without loss of output.

Figs. 4 to 7 show the results of tests made in the laboratory in which the device was applied to a coil of some 300 turns, a source of variable and reversible current of sufficient size for tests to be made on a straight run of cable not being available. The current through the coil and the output volts from the alternator were measured by B.S. first grade instruments. In Fig. 4 the output volts are plotted against ampere-turns for a test in which the latter were

Fig. 2.—The power pack, biasing and output rectifying circuits



1. Transformer. 2. Field rectifier. 3. Field smoothing condenser. 4. Bias regulator. 5. Motor field coils. 6. Bias coil. 7. Bias ammeter. 8. Starting rectifier. 9. Start-run switch. 10. Commutator/slipring unit. 11. Motor armature. 12. Generator rotor. 13. Generator coil. 14. Output rectifier. 15. Smoothing condenser. 16. Smoothing choke

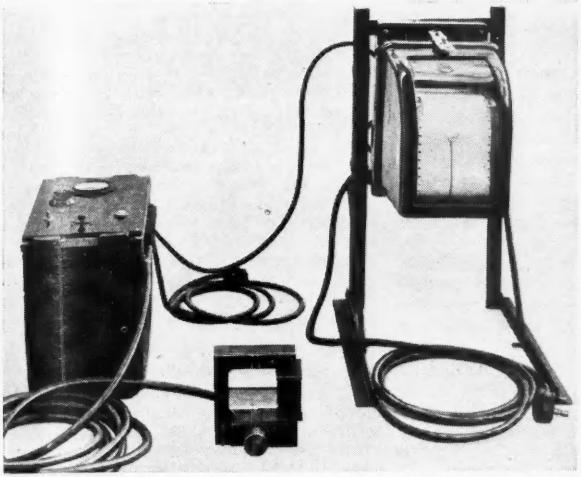


Fig. 3.—General view of complete equipment

taken three times through the cycle 0 to −550 to 0 to + 1,100 to 0 in steps. About 100 readings of the output were taken and Fig. 5 shows the percentage by which each differed from the value given by the mean line in Fig. 4, this percentage being taken on the mean value. Except for occasional points near the no-error line, all points above it were obtained with current increasing and all points below it with current decreasing. The accuracy is mainly dependent upon low hysteresis of the yoke and it is probable that better steel than that used could be obtained.

The limits laid down by B.S. 89 for first grade indicating meters of moving coil, moving iron or induction type are shown in chain line, the inner lines being without allowance for the use of a shunt and the outer lines with such allowance. It should be added that the B.S. limits for rectifier instruments exclusive of shunt errors are three times as wide. Figs. 6 and 7 are the results of similar tests using the 10 V range on the output meter instead of the 100 V range. The mean line from Fig. 6 appears also in Fig. 4 to indicate the effect of the change in meter range on the overall sensitivity.

The device, connected to a recorder, has been given an industrial trial in a steelworks where it was applied to a cable carrying the armature current of a 60 h.p. 220 V series wound motor driving a roller table between the roughing and finishing sections of a continuous bar mill where frequent stopping and reversing occur. A record was made simultaneously with a second recorder connected across a shunt, and it was noticed that the magnetically coupled recorder drew a thicker line than the shunt connected one. This was due to a small oscillation of the pen which could be reduced by fitting a larger flywheel. Is is thought that some oscillation is useful in reducing the effect of pen friction. The tests show that such a device as this

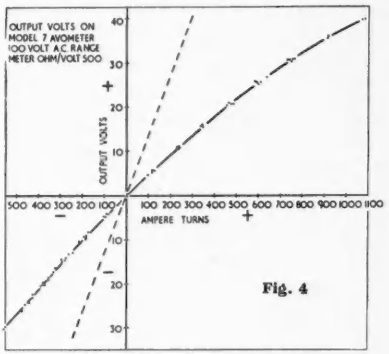


Fig. 4

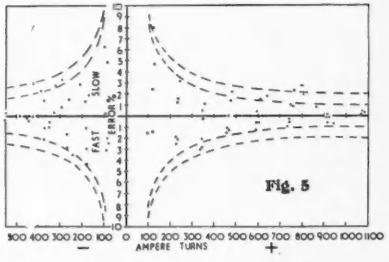


Fig. 5

will give with useful accuracy at substantially any distance a record of the magnitude and direction of d.c. in a cable without any electrical connection to it.

In return for some loss of accuracy in comparison with shunt connected meters, the advantage of application without breaking circuits or interrupting industrial operations is obtained. This is of particular value in carrying out tests on intensively-used plant, and in cases where a machine having several circuits works repetitively, one magnetic coupler moved from cable to cable can be used in place of several shunts connected in turn to one recorder, giving approximately the same results as simultaneously recording each.

It has the further advantage that only low potentials independent of those in the cables are used, extending to d.c. the benefit of the current transformer in a.c. systems and as one of these it can in fact be employed, rotation of the armature not then being necessary. British Patent No. 653,290 has been granted for the device.

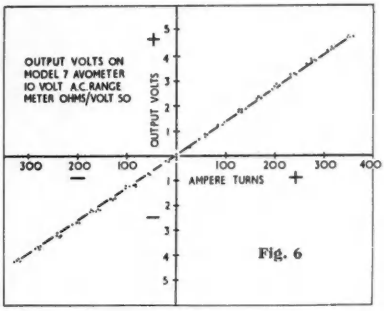


Fig. 6

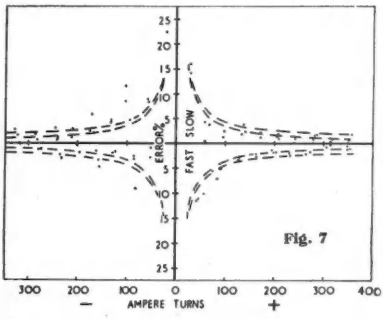


Fig. 7

LIGHTING NOTES

THE second stage of the relighting of classified roads and bus routes in COVENTRY, costing £15,000, is to begin next month. Actually it had been hoped to spend £25,000 this year but the estimates were reduced. The Corporation Safety Committee recently recommended the acceptance of tenders of the Revo Electric Co., Ltd., for the supply and erection of 290 Class "A" lamp columns (£6,453) and lanterns (£3,667); of the British Thomson-Houston Co., Ltd., for 290 mercury-vapour lamps, chokes and capacitors (£2,106); and of Venner, Ltd., for time switches (£964). In addition, for the installation of street lighting on new estates the Committee proposed to accept the tender of the Revo Co. for 350 Class "B" columns (£3,146); of the B.T.H. Co. for 450 m.v. lamps, chokes and capacitors (£1,588); and of Venner, Ltd., for 450 time switches (£1,498).

A trial installation of Class "A" fluorescent lighting has been put into commission in the centre of HULL. It utilizes Siemens F.T.F. 5513 3/80 "Wilton Sieray" lanterns, each housing three "Sieray Instant Start" 80 W fluorescent tubes. The lanterns are fitted to the existing trolley-bus poles. All the lanterns, lamps and associated equipment were supplied by Siemens Electric Lamps & Supplies, Ltd., and installed by the Hull Corporation Street Lighting Department.

Owing to opposition from the Royal Fine Art Commission, ENNERDALE (Cumberland) R.D.C. has modified its street lighting plan for Main Street. The Ministry of Transport, urging the Council to meet the Commission's objections, said the Ministry would be reluctant to contribute towards the cost of an installation which was not acceptable æsthetically.

DAGENHAM Highways & Works Committee has recommended the acceptance of the tender (£2,117) of the Eastern Electricity Board for the supply and erection of 42 Group "A" lighting units on the London–Tilbury trunk road.

For the third stage of the conversion of street lighting from gas to electricity the borough engineer of NORTHAMPTON has recommended the installation of two-tube fluorescent lanterns in a number of roads at an estimated cost of £9,475.

The MARYPORT U.D.C. is seeking loan sanction for £10,500 for converting the town's street lighting from gas to electricity.

CHESTERFIELD Corporation has received the consent of the Ministry of Housing and Local Government to the borrowing of £2,447 for the installation of street lighting on the Old Whittington housing estate.

HEBBURN-ON-TYNE U.D.C. has accepted the estimate of the North Eastern Electricity Board at £1,899 for the provision of street lighting on the Monkton Lane housing estate.

Nationalized Industry

Reassessment and Appraisal by the Trade Unions

From an Industrial Correspondent

FROM the first day of nationalization, trade union criticism has been continuous and has grown in volume as the industries one by one came under public ownership. Hardly any aspect of nationalization has escaped comment. The physical and financial structure of the industries, management, joint consultation, and industrial relations have been the main targets of trade union criticism, and there is now a solid corpus of trade union opinion on these common characteristics that cannot be ignored in any reassessment of the nationalized industries.

Unions' Views Sought

It was perhaps with this in mind that the Labour Party, through its Research Department, asked the unions to state:—(1) The extent to which joint consultation was operating at present in nationalized industries. (2) Whether existing machinery should be amended as regards either legislation or executive structure. (3) What steps the union was taking to prepare its officers and representatives for joint consultation.

The reply of the Electrical Trades Union to these questions was confined to the electricity supply industry. In a lengthy memorandum (published in its journal last November) the Union used the opportunity to set out its own criticisms of the nationalized industry rather than to give a direct answer to the questions. The memorandum indicated a considerable amount of dissatisfaction with the existing physical, financial and administrative structure of the industry which had found expression in critical resolutions passed at the Union's annual delegate conferences.

The Electrical Power Engineers' Association has also criticized certain aspects of the supply industry. In the June issue of the Association's journal, the *Electrical Power Engineer*, attention was drawn to the fact that in the last two issues "we have examined frankly several topical and controversial questions concerning the practices of the Electricity Boards." "We did this," the editorial explained, "not as opponents of or professional grumblers at the nationalized industry, but rather as its candid friends." There was, in the opinion of the Association, "a real need now for mental stock-taking and honest appraisal of both achievements and failings since vesting day."

In its answers to the Labour Party's questionnaire, the Electrical Trades Union drew attention to what it called "the industry's burden." This consisted of £341 million compensation stock and the £400 million of new stock issued between 1948 and 1952. In a reference to the rise in interest rates on new stock, following the increase in the bank rate, the E.T.U. observed "that two increases on the initial rate of interest involve an increase of interest of £2,600,000 per annum."

Representation of Workers

Not less critical were the Union's views on the management of the industry. It recalled that in 1932, when the Labour Party proposed the nationalization of the industry, "the Electrical Trades Union, in common with other unions represented on the N.J.I.C., protested at the absence of any reference to workers' representation." In 1947, when the Electricity Bill to nationalize the industry was under discussion, the Executive Council "decided that it was necessary to press for workers' representation at all levels."

Despite Mr. Shinwell's rejection of this point of view, the 1949 and 1950 delegate conferences of the Union carried with huge majorities resolutions severely critical of the Electricity Boards and the Central Authority, and again called for direct representation of the workers in the

industry. The 1951 conference, though none the less definite, was more specific. It demanded that in all nationalized industries half of the boards should be direct trade union representatives appointed from organizations whose members were employed in the industry concerned and that the trade unions should have the right to recall their elected representatives.

In reply to the Labour Party's questionnaire, the E.T.U. put forward proposals for an amendment to the Electricity Act to provide for representation on the Central Authority of five members "nominated by organizations whose members are employed in the generating and supply of electricity and which are recognized as appropriate under Section 53"—the members so appointed to be subject to replacement if and when desired by the nominating organizations. A similar provision was to apply to the Area Boards, but with four members instead of five.

Joint Consultation

The E.T.U. supports the principle of joint consultation, and has apparently found little wrong with the existing machinery. It is represented on the National Joint Advisory Council and the District and Local Advisory Councils. It has, however, expressed concern at what it calls the "disturbingly low proportion of recommendations [which] appear to be coming from the rank and file," and the "disturbingly high proportion of recommendations [which] are being rejected by the Area Boards." It has proposed "that the Boards should be obliged to implement recommendations from the N.J.A.C." which, it suggests, Section 6 of the 1947 Electricity Act would appear to make possible. But if this is not so, it proposes that the Act should be amended.

E.P.E.A. Criticisms

If the Electrical Power Engineers' Association has had much less to say on the "several topical and controversial questions concerning the practices of the Electricity Boards," it has, in its own restrained manner, been quietly critical of many aspects of the nationalized industry. For many years it supported nationalization, and put forward its own scheme in the exuberantly optimistic years of post-war planning.

The Association's most recent criticism has been concerned with responsibility in the industry, promotion policy and labour relations.

Acceptance of Responsibility

Posing the question "Man or system?", it was extremely critical of Lord Citrine's statement to the Select Committee on the Nationalized Industries. Lord Citrine had averred: "My experience is that one of the hardest things to do in a big organization is to get people to take responsibility." "There is," he said, "a tremendous what I might call fear of doing something which may be setting a precedent. They all want to be sure before they take action that they have consulted this man or that man."

The E.P.E.A. National Executive Council disagreed with Lord Citrine. Its view was that "while in theory the passing of responsibility 'down the line' to the man on the spot was accepted, in practice it was very difficult." Many members of the Executive, it was reported, "went so far as to say that the clumsy application of new forms of organization since nationalization had removed from the rank and file engineer much of that freedom to think and decide for himself which at one time he had taken for granted." The fault lay not in the man but in the system.

The E.P.E.A. concluded that "large scale organization *does* mean standardization of detail and when checking this for application, individual initiative and authority are often removed in the process." The reluctance of men to-day to take authority, "springs not from any failure in their nature, but from the character of their new environment."

But the E.P.E.A. had no remedy to offer. It was uncertain as to how far decentralization would improve matters. In any case, much centralization, whether rightly or wrongly, was inevitable. There was, however, little being done to bring the man who could see only one part of the show in sight of the general picture. "Communications," suggested the E.P.E.A., "might well be studied by Lord Citrine and his advisers." But in the meantime it was unfair to blame the rank and file engineer, for "he is no different in spirit, intelligence and determination from his father and grandfather who built up the electricity supply industry of this country."

The E.P.E.A.'s criticism of labour relations in the nationalized industry is again that of lack of responsibility. It contends that the negotiating bodies and officers of the B.E.A. have no authority to say " yes " or " no." " Where the true seat of power is to be found these days is something of a mystery," it says, and it declares that " the experience of E.P.E.A. officials is that it is tending to fly higher and higher and may soon go out of sight altogether. Everything has now to be referred and counter-referred, passed to committees and sub-committees, moved between outer and inner authority, months without end."

The E.P.E.A. discerned two practical schemes for labour relations which could be operated logically in big organizations. " The first is to make them the special responsibility of a department of experts confining the so-called ' line ' management to its purely technical functions. The second is to make labour relations part of management's normal administrative tasks, keeping the specialist departments, as such, purely advisory."

The E.P.E.A. prefers the second scheme, " for the reason that effective management can never successfully be divorced from the responsibility of saying yes or no on wages, salaries and conditions." As the E.P.E.A. sees it, " the trouble with British Electricity is that it operates neither one nor the other system properly, but has fallen into the habit of trying to muddle along with both at the same time."

All the muddle and delay that has arisen, the E.P.E.A. believes, could be avoided if " management [could] have restored to it the normal common sense power to decide everyday differences with responsible trade union officials. Let the negotiating bodies," it pleads, " become once again true Whitley Councils able to reach decisions in their own right automatically binding on all parties to the agreement."

There is something of nostalgia in the Electrical Power Engineers' Association's mental stocktaking and appraisal of the nationalized industry. The old arrangement had, it would seem, virtues as well as vices. While the vices may have been cast off, some of the virtues have also gone overboard.

As a fitting postscript, this motion from the National Union of Railwaymen, which appears on the preliminary agenda for the forthcoming Trades Union Congress, might be quoted:

" That it is the declared policy of this Trades Union Congress that there must be greater participation in the management and control of nationalized industries by the workers employed in these industries. In regard to Executive positions we demand 50 per cent representation, such representation to be drawn from the trade unions concerned in that particular industry. For managerial and administrative positions, we recognize that correct training is an essential pre-requisite, but such training must be the responsibility of the management with full co-operation from the trade unions. Selection of suitable trainees shall be the joint responsibility of the trade unions and the management."

Municipal Transport Results

WOLVERHAMPTON transport undertaking (general manager, Mr. R. H. Addlesee) last year carried 115·7 million passengers, 77·3 million in its fleet of 161 trolley-buses. On the trolley vehicle account there was a gross surplus of £127,250 (£114,912 in 1951–52), while on the motor-buses there was a loss of £424 (against a surplus of £3,535). There was thus a gross overall surplus of £126,825 (£118,447), but after meeting loan charges, etc., the net result of the year's trading was a loss of £14,344 (against a deficit of £18,853), which has been met from the reserve fund. Fare increases were put into operation on 13th April last. Statistics show that the trolley vehicle mileage last year was 5,860,492, electricity consumption (traction, d.c.) being 14 million kWh, or 2·401 kWh per mile.

Tramway routes operated by the SHEFFIELD Transport Department (general manager, Mr. R. C. Moore) last year remained at the equivalent of 91 single-track miles, but fewer car-miles were run (11·8 million against 12·5 million) and the number of passenger journeys fell from 163·9 million to 151·1 million. Electricity consumption per car-mile (including car lighting) averaged 2·963 kWh; altogether 38·4 million kWh was purchased. The result of the year's operations was a net balance of £44,525 (against £12,609) on the tramways and a surplus of £30,007 (against a loss of £66,789) on the motor-buses. A deficit of £260,547 had been brought forward; after setting against this the combined surplus of £74,533, rate aid received of £131,694, and certain transfers, the deficit carried forward is reduced to £18,127.

Off-Peak Heating

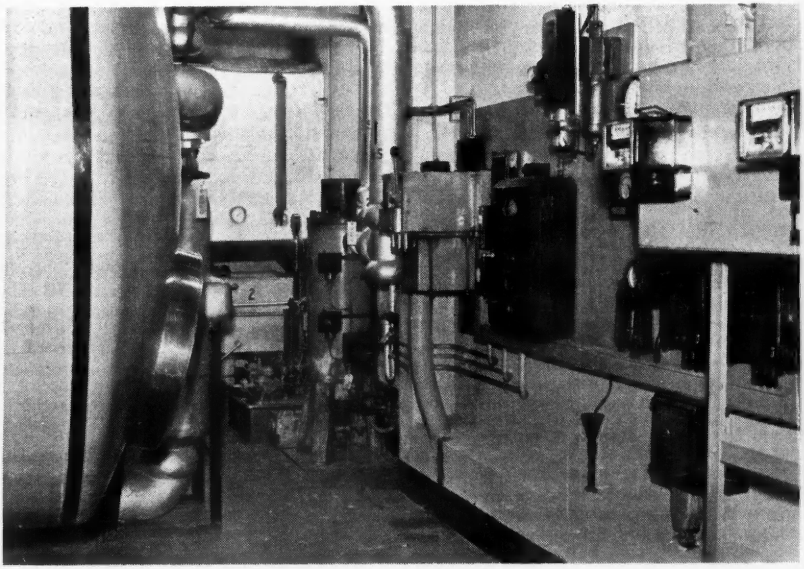
Provision for Steam Cooking, Space Heating and Domestic Hot Water

AN electrical heating installation to provide the whole of the steam cooking, space heating and domestic hot water supplies has just been completed at J. Sainsbury's new head office canteen building at Running Horses Yard, Southwark. Electricity is consumed during night hours only, and the heat is stored and is available in storage vessels for use during the twenty-four hours of the day. The three systems were designed by Sainsbury's own Development Engineering Department at the instigation of their chief engineer. Bastian & Allen, Ltd., supplied the electrode hot water and steam boilers and immersion heater elements for the domestic hot water plant.

For the central heating an electrode boiler rated at 150 kW has been installed, together with a storage vessel having a capacity of 5,000 gal. The boiler is started up at night by time switch control and the water is heated in the storage vessel until it reaches the required storage temperature of 220 deg F. A flow control thermostat inserted in the pipework between the boiler and storage vessel limits the flow temperature, and there is a control thermostat in the storage vessel. In the event of the normal control failing a safety thermostat set at 230 deg F and mounted in the top of the boiler would trip the main oil circuit breaker.

During the heating season the hot water is circulated in the daytime from the storage vessel through a mixing valve and the high temperature water is blended with water from the secondary return of the heating system to give the designed flow temperature of 160 deg F. Outdoor

Electrode boiler, control gear and end of steam accumulator for providing steam for cooking



temperature compensation has been provided, the compensator, thermostats and mixing valves being supplied by the Rheostatic Co., Ltd.

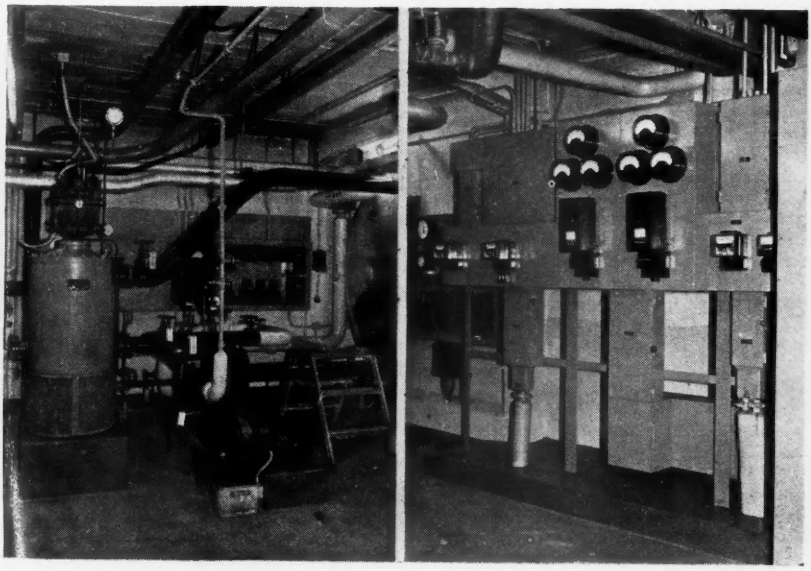
Three Pulsometer circulating pumps are provided fitted with Crompton Parkinson ½ h.p. motors and Allen West starters. One pump is for the primary system and one for the secondary system, while the third is a stand-by, the pipework being so arranged that it can be used for either primary or secondary duty. All the pipework and vessels in the boiler room are adequately lagged, and the storage vessel is insulated with two layers of 1½in cork slab set in ¾in 80 per cent magnesia plastic, covered with galvanized wire and hard setting compound.

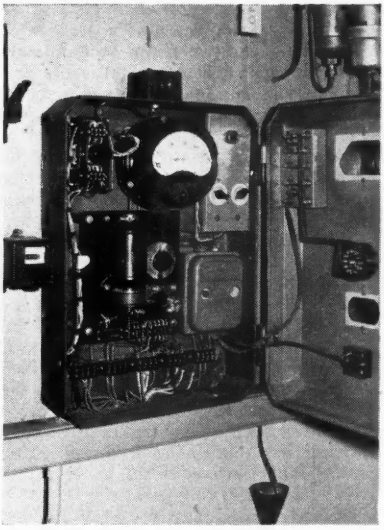
From April, 1952, to April, 1953, the consumption of the central heating plant amounted to 196,350 kWh, which is very economical when it is considered that, apart from use during the daytime, the canteen is available throughout the night as well as for evening social gatherings.

The canteen serves approximately 1,000 principal meals a day, besides providing hot drinks throughout the day and night. To supply the necessary steam there is a boiler rated at 150 kW and capable of giving 500 lb/hr of steam at a pressure of 80 lb/sq in. The two steam accumulators have a capacity of 2,500 gal each and provide a total storage capacity of 4,000 lb of steam. The boiler is started up by time switch control at 7 p.m. and shut off at 7 a.m. each day. Steam is taken from the boiler to an injector charging device (supplied by British Boiler Accessories, Ltd.), which is connected to flow and return pipes on the accumulators. Steam is supplied to the kitchen from the accumulators through a 2in pipe and the pressure is reduced to 17 lb/sq in to ensure that the pressure of steam in the kitchen is 15 lb/sq in.

About 70 per cent of the condensate is returned and make-up feed water is taken from a base exchange water softener to the main tank where the condensate is collected during the day. This tank, in turn, is connected to a small boiler feed tank which supplies the electrode steam boiler. This mixing of water can give rise to wide variations in conductivity and Bastian & Allen have designed an automatic bleed, electronically operated to maintain conductivity over a close range. A conductivity cell transmits a varying response to an

The thermal storage plant for space heating and distribution board for the whole building





The control panel for the steam plant for cooking

electrically operated relay which thereby measures the conductivity of the water. When the conductivity rises a magnetic valve is energized to bleed away the water with excessive conductivity and on fall of conductivity the relay closes the valve. The electricity consumption for steam production during the twelve months to April, 1953, was 576,700 kWh.

Hot water for the cloakrooms, lavatories, kitchens, sinks, etc., is provided from two 500 gal capacity storage vessels, fitted with immersion heater elements, rated at 33 kW and time switch controlled. The hot water system is based on constant temperature and while water is being drawn off during the day no cold water is allowed to enter the vessels, and make-up water is not admitted until 7 p.m., when heating recommences. Instruments are provided to indicate the temperature and quantity of the water in the vessels. The electricity consumption for domestic hot water from April, 1952 to April, 1953, was 105,500 kWh.

With the entire load taken during night hours, the tariff for electricity is 0·8d per kWh. The plant has now been in operation for two years and the company is very satisfied with the equipment and the way in which it has worked.

Apart from the apparatus already mentioned, the boiler room houses the main oil circuit breaker (Statter), switchgear (Kartret) and distribution gear for the whole of the new building which, besides the canteen, includes canteen offices, housekeeping section and "empties" department, including seven conveyors and a cardboard baling press. The electrical wiring was carried out by Bell Bros. & Co. (London), Ltd., who supplied the distribution gear. Richard Whittington & Co., Ltd., were the heating contractors, the insulation of storage vessels and pipework being done by McAndrew & Wormald, Ltd.

Welsh Power Prospects

THE chairman of the Welsh Board for Industry, Sir Percy Thomas, has announced that electricity load spreading will not be necessary in South Wales factories and works this winter. In a statement last week he said the decision was the outcome of a meeting of the J.C.C. Electricity Sub-Committee at headquarters level followed by consultations between himself, the South Wales Electricity Board, and the British Electricity Authority.

"We have taken into account," he said, "the fact that new generating sets at the Uskmouth and Carmarthen Bay power stations will be in operation and that these are likely to prove a substantial addition to the area's generating plant resources as compared with last winter." On the other hand, the demand for electricity in the area had shown a steady growth which reflected increased industrial activity. Certain private generating plants previously in use would not be available for the coming winter due to their age and obsolescence.

Assuming average winter conditions, the generating plant resources of the area should be capable of meeting the anticipated load for the winter, but there was by no means a generous margin of plant capacity above load requirements. Sir Percy said that should conditions deteriorate due to exceptionally severe weather or to serious breakdown it might be necessary to call upon industry at short notice to reduce electricity demand during peak hours.

School Tariffs

OXFORD Education Committee has told the Southern Electricity Board that it is still dissatisfied with the proposal to apply the new commercial tariff to schools, which are often closed at peak load periods. Moreover, the Board, it is thought, has a "moral obligation" in view of the situation that obtained when it was decided to install electricity in preference to any other form of heating.

COMMERCE and INDUSTRY

Maltese Distribution System

McNary Dam Tenders

A CONTRACT, valued at over £650,000, for the underground cables and overhead lines of a new electrical distribution system in Malta has been awarded to Crompton Parkinson, Ltd., by the Crown Agents for the Colonies, on behalf of the Government of Malta. The consulting engineers are Messrs. Preece, Cardew and Rider. The new system will distribute the electrical power supplied from the generating station which is being constructed in Malta. The present system of single-phase a.c. distribution at a frequency of 100 c/s will be superseded by a new three-phase a.c. system at 50 c/s. Crompton Parkinson will be responsible for supplying all the material for the high-voltage and medium-voltage conductor networks, laying the underground cables, erecting the overhead lines and putting them into service. It is expected that the work will be spread over three to four years. The actual work of installation will be started by the end of October next.

Model Engineering Show

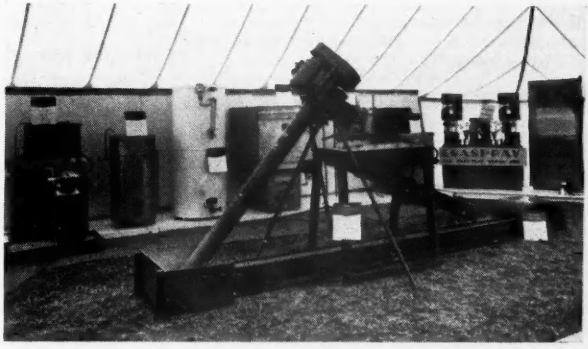
The "Model Engineer" Exhibition is being held at the New Horticultural Hall, Westminster, S.W.1, from 19th to 29th August. The exhibition is open to the public daily, except Sunday, from 11 a.m. to 9 p.m.

Scottish Agricultural Display

At the annual show of the Berwickshire Agricultural Association held in the grounds of Duns Castle the South East Scotland Electricity Board was awarded the first prize for the best exhibit in the trade display section.

In addition to the Royal Highland Show, the Board has exhibited this year at eight major day shows. At all of these the keen interest of farmers in the applications of electricity to farming has been well marked.

The Board's exhibit was staged in a large marquee and particular attention was given to the displaying of the latest developments in equipment for the dairy, barn, crop treatment, pumping, poultry, grain drying and applications of electricity to farming. A special Coronation feature was incorporated in the display.



The S.E. Scotland Board's agricultural display

United States Rejects Foreign Tenders

A *Reuter* message from Washington reports that the Department of the Interior has rejected two foreign bids for electrical equipment—one reportedly by Ferranti—for a higher American tender. But it accepted a bid for other equipment from a Japanese company.

The two rejected foreign tenders were for six 345 kV transformers to deliver power from the McNary Dam to the Portland (Oregon) area. Mr. F. Aandahl, assistant secretary of the Department, said last Friday that the foreign offers "did not meet the specifications."

The generators contract was awarded to the Allis-Chalmers Manufacturing Company, which bid $2,005,378. The Japanese contract, for 100,000 units of high voltage suspension insulator, was given to the Nippon Kaisha Company of Nagoya.

New Petroleum Depot

The new Pickering depot of Shell-Mex and B.P., Ltd., embodies the latest ideas in design and equipment in order to provide quick, cheap and efficient service. The storage compound contains two vertical tanks, each holding 86,000 gal, and fourteen horizontal tanks, each of 12,000 gal, a total of 340,000 gal. The main pump house contains ten motor-driven centrifugal pumps (Drysdale & Co., Ltd.), each delivering 250 gal/min and controlled by Allen

West push-button switches on the filling gantry. There is also a small screw displacement stripper pump for general duties.

Six wagons at once can be filled under cover, and as the gantry is fed by a separate pump for each product there is no risk of contamination. There are twelve separate outlets, each with a filter, air separator, positive displacement meter and a spring balanced loading arm.

Both yard and tank compound are floodlit at night, and there is recessed lighting in the inspection pit used for vehicle maintenance. The latest servicing equipment includes pressure greasing, power washing and a multi-point air compressor. Two-way loudspeakers link the offices with the filling gantry, tank compound, and lubricating oil package building. The electric power and lighting systems, which conform to British Standard requirements, were installed by Troup Curtis & Co., Ltd. The Portaway earthing system was used extensively throughout.

Belfast Plant Contracts

We reported last week that the Ulster High Court had granted an order restraining the Belfast Corporation from entering into a contract with Babcock & Wilcox, Ltd., for boilers and equipment in connection with an electricity scheme. Actually, after consultation and legal argument, it was decided to proceed by notice of motion. Accordingly, the matter was adjourned until 25th August, the Corporation to be duly served with notice in the meantime.

The prosecutor was Alderman Major W. C. M'Kee, who on his own behalf and of other interested parties, asked for an order which in effect would stop the contract being completed. Counsel submitted that provision of these boilers had not been put out to public tender, which, the prosecutor submitted, was demanded by statute and by the standing orders of the Corporation. Instead, tenders were asked from five selected firms, and a tender put in by Babcock & Wilcox, one of the five, was accepted. The five selected firms were in an Association, and the majority of members of that Association and a considerable number of firms outside it were prepared to carry out the contract at a figure less by £250,000 than the tender.

Educational

A complete guide to the London County Council's evening classes for the 1953–54 session, beginning in September, is contained in "Floodlight," a 60 page booklet now available from newsagents, etc., at a cost of 6d (9d by post). The subjects covered, numbering over 500, are listed alphabetically and include all branches of electrical and radio engineering, boiler-house practice, electro-deposition and metal finishing, electro-medical apparatus, electro-metallurgy, electronics, illuminating engineering, instrument making, telecommunications, television, and welding. A separate pamphlet entitled "Day Courses in London Colleges" may be obtained free of charge from the Education Officer (G.P.2), County Hall, S.E.1.

Copies of "A Student's Guide to Engineering Education" and "Post Advance Lectures in Electrical & Mechanical Engineering" for the session 1953–54 are now obtainable from the Manchester and District Advisory Council for Further Education, Education Offices, Deansgate, Manchester, 3.

Admiralty Radio Telephone

A new radio telephone equipment has been designed and its manufacture just commenced by Rees Mace, Ltd., the marine specialists in the Pye group of companies. This Type 619 set, which embodies the latest technique in marine communication equipment, comprises four units: a high quality communications receiver with low radiation characteristics to combat the submarine menace (frequency coverage 60 kc/s to 32 Mc/s), an h.f. transmitter (1·5 to 16 Mc/s), an m.f. transmitter (330 to 550 kc/s), and an a.c. power unit.

Although the equipment is mainly for the squadrons and flotillas, most ships in the Royal Navy will eventually be fitted with a set of this type, which is based on experience gained during the war and the Admiralty's assessment of future problems.

Hoover in Australia

Sir Charles Colston, chairman and managing director of Hoover, Ltd., addressing a recent gathering of the company's executives, confirmed the news of the establishment of a new Australian subsidiary manufacturing company to be known as Hoover Industries Proprietary, Ltd. This did not, however, mean a lessening opportunity for the marketing of British made Hoover products in Australia. It meant increased earning capacity over and above existing Australian import quotas.

Telephone Development

The Post Office has just installed the six millionth telephone and there are now twice as many telephones as there were in 1938.

Claim for Damages Fails

A claim for damages for personal injuries by a Rugby man against his employers failed at Birmingham Assizes last Friday, the judge commenting that workmen must use their common sense.

The case, which was adjourned from Warwick Assizes, was one in which William George Owen, aged thirty-two, of 28, Oxford Street, sued his employers, the British Thomson-Houston Co., Ltd., alleging a breach of statutory duty. For the plaintiff it had been stated that he injured his elbow when he fell awkwardly in avoiding a 30 ton casting, blocking a gangway which it was the firm's statutory duty to keep clear. As a result of the injury he received, he

now had to do work which paid him 10s 10d a week less in wages.

The defence denied liability and claimed that Owen could have gone round another way to avoid the casting.

Giving a reserved judgment with costs for the defendant company, Mr. Justice Sellers said in 99 cases out of 100 there would have been no danger in scrambling past the obstruction in the gangway. If the plaintiff had thought there was any danger, there were other ways he could have gone to get back to his work. "Common sense must be used by workmen over matters like this," said the judge. He held that there was no breach of statutory duty by the firm, and added that if he had found in favour of the plaintiff he would have awarded £500 in addition to the £140 agreed special damages.

Miss Barbara Hanforth demonstrating to delegates to the Home Economics Congress

Guide to Radio Show

This year's Radio and Television Exhibition is being held at Earls Court from 2nd to 12th September. The *Wireless World* is publishing a guide to the show on 25th August. This will list all exhibitors, show the positions of the principal specialist displays, demonstrations, etc., and provide classified and tabulated information. The second special issue, in October (published 29th September), will contain a complete review of the show and provide a technical survey of trends for 1953–54.

Home Economics Conference

The Eighth International Congress on Home Economics was held in Edinburgh from 12th to 18th August and among representatives of the Electrical Association for Women who attended were Dame Caroline Haslett, D.B.E., J.P., Miss Vera Norvick, assistant secretary, and Miss M. E. Bailey, B.Sc., head of the Housecraft Department. The E.A.W. took part in three exhibitions in Edinburgh from which the delegates from 45 nations could see advances made in this country. The United Kingdom stand displayed framed E.A.W. certificates in electrical housecraft awarded to teachers, demonstrators, home workers and electrical sales assistants. A special E.A.W. stand showed the contribution which the Association has made to home economics through its chart series illustrating the construction of electrical apparatus and the wiring of accessories, and its varied publications on electrical housecraft; it was staffed by members of the Edinburgh E.A.W. Branch. Over 1,200 women from forty-seven countries participated in the conference. The Electrical Development Association acted jointly with the E.A.W. in providing informative material for delegates, and hospitality.

During the period a special display of domestic appliances was arranged by the English Electric Co. in co-operation with the South East Scotland Electricity Board in the Board's Edinburgh showrooms. Demonstrations were given daily throughout the Congress at the Electricity Service Centre and the demonstration hall was available to delegates as a clubroom each evening, members of the showroom and demonstration staff being available to answer questions. The illustration shows Miss Barbara Hanforth, the English Electric Co.'s demonstrator for Scotland, showing the company's food mixer.

Examination Results

In the thirty-third certificate examination in electrical housecraft for demonstrators and saleswomen held by the Electrical Association for Women in June eighty candidates qualified, three with distinction, bringing the total number of certificate holders to 2,014. Thirty-one candidates qualified, also three with distinction, in the thirtieth E.A.W. certificate examination for teachers, making the total number of certificate holders 1,817. Nine of the successful candidates in the fourth examination for electrical sales assistants held in May gained distinction: the total number of holders of these certificates is now 117.

Signalling for Cowlairs

The contract for the resignalling of Cowlairs (Glasgow), Scottish Region, British Railways, has been awarded to the Westinghouse Brake & Signal Co., Ltd., which will be responsible for the supply and installation of the whole of the signalling apparatus. This installation, at present operated from eight mechanical signal boxes, will be replaced by the company's O.C.S. system from a control desk and diagram in one central signal box. It will include multi-aspect colour light signals with position light subsidiaries, junction and route indicators, electro-pneumatic points and a.c. track circuits, while

remote points will be electrically operated. Plug-in relays will be used throughout. Standby power plant, together with main and standby compressor plant, is also included. The whole installation covers approximately fourteen track miles and includes work in connection with three adjoining mechanical boxes.

Recent Lighting Installations

Owing to a substitution of pictures one of the illustrations of modern lighting installations in last week's issue (page 353) was wrongly described. Photograph No. 5 showed the lighting in the canteen, not the drawing office, at Bankside House. The installation consists of 5ft 80 W "Osram" fluorescent lamps in "seagull" fittings attractively arranged around the daylight dome.

Prices of Materials

In the accompanying table we give the basic prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £150 0s 0d
COPPER, H.C. Electro	ton £230 0s 0d
Fire Refined 99·7% per cent ..	ton £229 0s 0d
Fire Refined 99·50 per cent ..	ton £228 0s 0d
COPPER Tubes	lb 2s 3d
Sheet	ton £289 0s 0d
H.C. wire and strip	ton £260 0s 0d
LEAD, English	ton £95 0s 0d
Foreign	ton £93 10s 0d
MERCURY	flask £70 10s 0d
TIN	ton £610 0s 0d
ZINC, G.O.B. Foreign ..	ton £71 0s 0d
Electrolytic	ton £72 0s 0d
BRASS Tubes	lb 1s 10d
Sheet	ton £234 0s 0d
Wire	lb 2s 5½d
PHOSPHOR BRONZE	
Wire	lb 3s 7½d
RUBBER, No. 1 R.S.S. spot ..	lb 19½d–19¾d

Domestic Appliances for Rhodesia

Representation is sought by a firm of manufacturers' representatives and distributing agents in Bulawayo, Southern Rhodesia, for British domestic electrical appliances. We shall be pleased to forward literature or correspondence from any interested manufacturers.

Trade Announcements

The address of the Newcastle Area sales office of the **Northern Aluminium Co., Ltd.**, as from 24th August, will be Groat House, Collingwood Street, Newcastle-upon-Tyne, 1 (telephone: Newcastle 20878/9; telegrams: Noraluco Newcastle-upon-Tyne).

Mr. L. Maynard, 13a, Gillingham Street, London, S.W.1, has been appointed agent in London and Home Counties for **Heatovent Electric, Ltd.**, Glasgow, and holds small stocks of "Turvec" heaters.

The **Selson Machine Tool Co., Ltd.**, has considerably extended and reorganized its showroom at Cunard Works, Chase Road, London, N.W.10. The company, one of the "600" group (George Cohen Sons & Co., Ltd.), handles a considerable range of machine tools as sole agents in Great Britain for American and Continental manufacturers.

Siemens Electric Lamps & Supplies, Ltd., is opening a new sales depot at Fylde Road, Preston, Lancs (telephone: Preston 86701), on 1st September. The new depot will be a subsidiary of the Manchester branch and under the control of Mr. A. J. Barry, the Manchester manager. A van delivery service will be operated from the Preston depot.

The new agents in Birmingham for **British Electric Lamps, Ltd.**, are Terraspan, Ltd., Works No. 2, 1853, Pershore Road, Cotteridge, Birmingham, 30. Mr. A. E. Luen, 17, Dumfries Place, Cardiff, has been appointed agent for the area covering Pembroke, Carmarthen, Glamorgan, Monmouth, Gloucester, Somerset, Devon and Cornwall. Both agents carry large stocks of lamps.

The Plastics Division of **E. K. Cole, Ltd.**, has appointed Mr. J. Buckingham as technical sales representative for the north-east area.

The **John Morris Electrical Engineering Co., Ltd.**, is moving on 31st August to Vulcan Road, Bilston, Staffs. The telephone number is unchanged.

The London address of **Heyes & Co., Ltd.**, is now 11, John Street, London, W.C.1. (telephone: Holborn 4183).

Catalogues and Lists

Rawlplug Co., Ltd., Rawlplug House, Cromwell Road, London, S.W.7.—53rd edition of the "Rawlplug" catalogue.

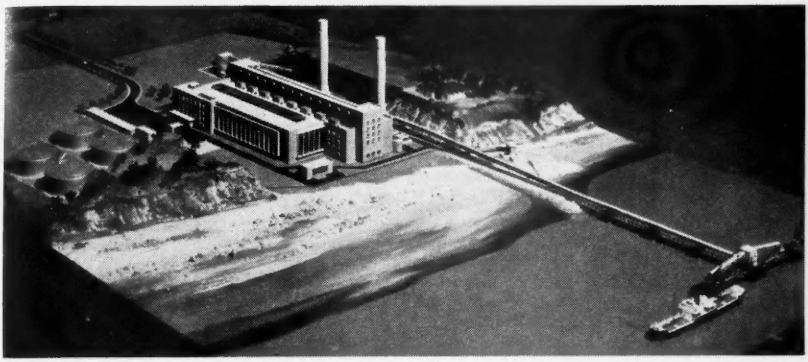
Automatic Telephone & Electric Co., Ltd., Strowger Works, Liverpool, 7.—Leaflet illustrating the company's underground locomotive haulage signalling system Type 50.

Thorn Electrical Industries, Ltd., 105-109, Judd Street, London, W.C.1.—28-page illustrated priced catalogue of "Atlas" lighting fittings (AL/114A).

Electrothermal Engineering, Ltd., 270, Neville Road, London, E.7.—20-page priced catalogue illustrating a range of laboratory heating equipment.

Alpha Machines (Tools), Ltd., Avenue Works, Romford, Essex.—Illustrated brochure relating to the new Alpha "Lawn Master" conversion kit for lawnmowers.

Audix B.B., Ltd., Hockerill Works, Bishop's Stortford, Herts.—Illustrated brochure of broadcast equipment and sound installations for schools, hospitals and industrial establishments.



New Singapore Station

First Stage of Pasir Panjang in Operation

THE new Pasir Panjang power station, Singapore, was officially opened on 3rd July by Sir John Fearns Nicoll, K.C.M.G., Governor of Singapore. It is situated about five miles from the centre of the city, is well sited and attention has been paid to both the industrial and domestic development of the island. When completed the full capacity of the station will meet all demands for some years to come.

The station buildings have been designed to conform to modern architectural standards and although the station will not operate under the highest steam pressures and temperatures which are available at the present time, it will offer an economic and reliable supply of electricity for all purposes and will rank as one of the most efficient power stations in the Far East. Construction work started in December, 1950, and the first turbo-alternator and boiler were in operation on 9th December, 1952. The total installed plant capacity will be 150 MW as compared with the present capacity of 37 MW at St. James power station.

The station is on the south-west side of the island, immediately adjacent to the coast, and has a site area of some twelve acres. The main building is at right angles to the coastline and the unloading bay commanded by the turbine room crane is at the north-west end of the building. It is connected to the Pasir Panjang road by a main approach roadway which also gives access to the offices, workshops, stores and laboratory.

The turbo-generating sets are arranged transversely across the turbine room, while the boilers are in a single line parallel to the turbine room. All switchgear and control equipment is in an annexe to the main building which also provides accommodation at basement level for the condenser circulating water pumps.

Power is delivered initially from the station by 22 kV underground cables but space has been provided for the necessary transformers and switchgear to enable the supply to be stepped up for connection to h.v. transmission lines should these be required in the future. The scheme includes a jetty and wharf for handling oil fuel supplies from seagoing tankers (and if necessary coal supplies) to the station. The bulk oil storage tanks, which provide the fuel for the station in the first instance, are to the north of the main building, but an

Above: **Model of the completed Pasir Panjang power station**

area to the south is reserved for coal storage and handling if required.

The main building is of steel frame construction and the floor and roof are of reinforced concrete. The height of the building from basement floor level is 116ft and the width 279ft. On completion of the building the total length will be 548ft; the whole of the steelwork has been supplied from the United Kingdom.

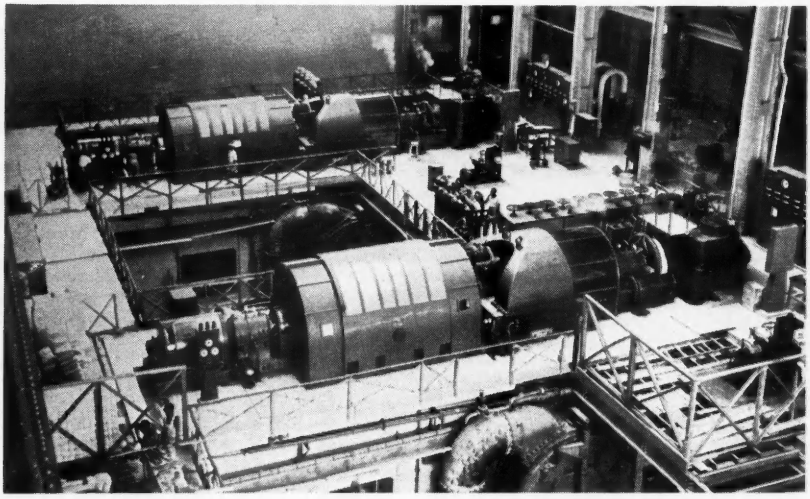
The design of the station provides for a maximum installed capacity of 152 MW, comprising six 25 MW main generating sets and one 2 MW house service set. The initial installation comprises two main generating sets and a house service set together with four boilers of 187,500 lb/hr maximum continuous rating. Contracts have been let for three further main generating sets and the corresponding boiler plant.

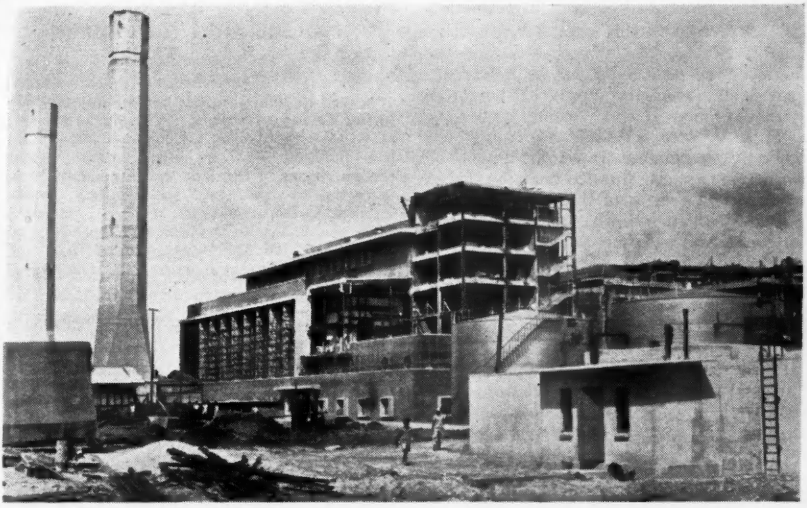
The boilers are of the Babcock & Wilcox high head straight tube header type, with horizontal self-draining superheaters. They operate at a gauge pressure of 625 lb/sq in and supply superheated steam at 825 deg F. Each boiler furnace has a volume of 8,300 cu ft and is flanked on three sides with Bailey block protected water tube walls. Immediately above the furnace is the main evaporative bank of tubes through which the products of combustion pass on the way to the superheater, economizer, air preheater and outlet flue.

In the first instance oil fuel is used for firing and is supplied to the boilers by individual pumping and heating units, interconnected by a common feed header. Should coal burning be adopted in future Babcock-Detroit "Rotograte" automatic spreader type stokers will be used. When coal is to be used arrangements have been made for the refiring of the unburnt carbon in the grits which are collected in the economizer hopper. In addition, multicell centrifugal dust extractors are installed between the economizers and air preheaters to deposit about 90 per cent of the residual dust into collecting hoppers. A system of vacuum extraction removes these fines to a central tank for loading into lorries. A single main gas flue measuring 12ft by 10ft at its largest section and 425ft long will eventually serve all nine boilers. This flue is constructed of steel plate throughout, is well lagged to prevent internal condensation, and is connected at two points to the concrete chimneys.

The operation of the boiler plant and its auxiliaries, and the control of the combustion conditions, can be either manual or automatic. For this purpose each boiler

Interior of turbine room showing the two 25 MW, 22 kV Metropolitan-Vickers turbo-generator sets recently installed





General view (April last) showing the constructional progress of the station buildings seen from the boiler house side

is provided with manual and automatic control cubicles.

The turbines are of the two-cylinder, single exhaust type, with duplicate steam transfer pipes between high and low pressure cylinders. The alternators are directly coupled to the turbines and have directly coupled main and auxiliary exciters. They are ventilated by independent motor driven fans operating in a closed circuit which incorporates air coolers supplied with cooling water from the circulating water system.

The condenser for each turbine set is of the single shell type, of welded construction with cast-iron water boxes. Each unit is arranged for two-pass flow of the cooling water through the 5,520 aluminium-brass alloy tubes which are fitted internally. The rate of water flow through each condenser is 26,000 gall/min.

The circulating water is supplied to each condenser by duplicate vertical spindle pumps located at basement level. Each pump is driven by a 155 h.p. 415 V motor and is of sufficient capacity to provide for the maximum economical rating of the turbine set (20 MW). Maximum efficiency is obtained from the steam cycle by introducing four-stage bled steam feed heating, comprising a single l.p. heater followed by three h.p. heaters associated with each turbine set. The h.p. heaters are fitted with the customary automatic by-pass arrangements as a protection against tube failure. Each set is provided with duplicate motor driven condensate extraction pumps, and two-stage steam operated air ejectors. Individual surge tanks are provided in the l.p. feed system, which serve to balance the condensate feed flow to the boiler feed pumps and also to introduce the necessary make-up feed water.

Since the electrical energy is at present transmitted from the station at 22 kV, which is the generator voltage, no intermediate transformers are required. The 22 kV main switchgear is adjacent to the turbine room between the alternator terminals and the outgoing feeder cables to the city's substations. It is of the metal-clad, horizontal isolation, oil-immersed circuit breaker type of 1,000 MVA rupturing capacity with duplicate busbars and off-load plug section. This gear is in three sections, each controlling two main generators and a number of outgoing feeders. Bus section switches, bus couplers and busbar zone protection are provided. Section "A" controls two main stepdown

station transformers and Sections "B" and "C" each control one main station transformer. The three main station transformers each of 3,500 kVA capacity provide the auxiliary supply to the station system at 6,600 V.

These 3,500 kVA transformers feed 6,600 V switchgear rated at 250 MVA rupturing capacity situated near the turbine room. The gear is of the metalclad compound-filled single busbar pattern arranged for horizontal isolation and is sectionalized in a similar manner to that of the 22 kV main switchgear.

The 250 MVA 6,600 V switchgear controls a battery of 19 stepdown transformers mounted in the station basement. These transformers, each rated at 750 kVA, are fitted with hand operated off-load tap change gear for voltage control. They supply the station general auxiliary switchgear at 415 V.

The station cable supply system is divided into three groups of 22 kV, 6,600 V and 415 V with the cross-sectional copper areas varying from the largest of 0·75 sq in in the 22 kV group to the smallest of 0·002 sq in in the 415 V group.

All essential manual and automatic controls are centralized in a control room adjacent to the turbine room from which the engineer-in-charge can direct operations throughout the station. Under normal conditions, however, control is effected from switchgear mounted adjacent to plant and the duty of the engineer-in-charge is solely to direct the operation of the station plant.

Acknowledgment is due to Mr. C. C. Payne, M.I.E.E., city electrical engineer, Singapore, for the information supplied in this article and to Messrs. Preece, Cardew and Rider, the consulting engineers for the station, for illustrations. The main contractors for the station are:—Civil and building engineering works, George Wimpey & Co., Ltd.; turbo-generator plant and transformers, Metropolitan-Vickers Electrical Co., Ltd.; steam raising plant and pipework, Babcock & Wilcox, Ltd.; oil storage plant, Whessoe, Ltd.; gas turbo-alternator, C. A. Parsons & Co., Ltd.; switchgear, A. Reyrolle & Co., Ltd.; cables, W. T. Henley's Telegraph Works Co., Ltd.; overhead cranes, Herbert Morris, Ltd.; screens and penstocks, Ledward & Beckett, Ltd.; vacuum extraction plant, British Vacuum Co., Ltd.; and air conditioning plant, J. & E. Hall, Ltd.

Iron and Steel Corporation

THE Iron and Steel Corporation of Great Britain, at its last meeting on 12th August, approved its final accounts and submitted them to the Minister of Supply. With the submission of these accounts the Corporation fulfilled its last function and on 13th August, under the provisions of the Iron and Steel Act, 1953, it ceased to exist. All the property, rights, liabilities and obligations of the Corporation have now passed to the Iron and Steel Holding and Realisation Agency, the British Iron and Steel stock outstanding to the amount of £243,593,077 becoming Treasury 3½ per cent stock.

Production in the first half of this year reached a new record, but group profit figures are not available as the companies have not been required to make up their accounts to the end of the Corporation's accounting period. For the period 1st October, 1952, to 12th July, 1953, the income of the Corporation amounted to £4,192,379, representing dividends received on share capital of the Corporation's subsidiary companies, together with interest on loan capital. The unappropriated surplus was £720,989. At 12th July, the book value of the share and loan capital in subsidiary companies at cost was £252,287,603, the Iron and Steel stock at that date standing at £243,593,077. Copies of the accounts may be obtained from the Iron and Steel Holding and Realisation Agency, 1, Chester Street, London, S.W.1 (price 5s).

Hydraulic Thrust Boring

AN interesting application of a hydraulic thrust boring machine to electrical needs has been announced by its manufacturers, E. Pass & Co., Ltd., of Denton, Manchester. The machine, which is already being used by water undertakings, has, we are told, recently been adopted by the Post Office as a method of boring for cable laying, and interest has also been aroused among several of the Electricity Boards.

The machine is capable of exerting a thrust of 18 tons to the boring rods, conveyed by hydraulic cylinders moving along fixed rams. A single cylinder differential pump delivers oil through h.p. flexible tubing to a patent distribution valve on the machine carriage; by rotating the valve lever a choice of four speeds is obtained from a constant speed of operation of the pump. A clean straight bore is achieved and various sizes of boring heads allow adjustment over pipe size ready for the installation of any type of cable or conduit. The machine makes extensive excavations unnecessary, the ground surface being undisturbed during boring operations.

ELECTRICITY SUPPLY

Standardization of Farm Tariffs

New Altrincham Substation

HAVING already standardized its tariffs for domestic, commercial and industrial supplies, the Merseyside and North Wales Electricity Board now proposes to introduce standard charges for farms. The new tariff follows the pattern recommended for adoption throughout the country, and has been designed to take account of the characteristics of the farm load, which differ from those of the commercial and industrial load. Many farms are combined with the farmhouse, and in order to reduce costs to the Board and the farmer, there is a combined tariff available which, it is anticipated, will be the most suitable for a large proportion of the farmers in the Area. Alternatively, a separate block tariff can be applied to the farm and the Board's standard domestic tariff to the farmhouse. Details of the block tariffs are as follows:—

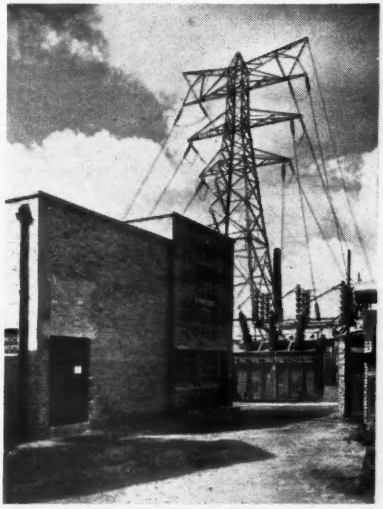
For farms with farmhouse.—Primary block of 150 kWh per quarter plus the appropriate domestic block for the farmhouse, based on the number of assessable rooms, in accordance with the standard domestic tariff, at 4½d/kWh. For all consumption in excess of the primary block, 1d/kWh. Where the aggregate rating of the electrical appliances on the farm, including lighting (but excluding all domestic appliances used in the farmhouse) is in excess of 25 kW the primary block is increased by 10 kWh per quarter for each complete kW above 25 kW.

For farms where there are no domestic premises, or where the standard domestic tariff is applied to the farmhouse.—Primary block of 250 kWh per quarter at 4½d/kWh. For all consumption in excess of 250 kWh per quarter, 1d/kWh. Where the aggregate rating is in excess of 25 kW, the primary block is increased as above.

Where supplies are taken through prepayment meters, the primary block in each tariff will be 5d/kWh. Maximum demand tariffs for commercial and industrial supplies are all available to farmers. The Board's proposals have been communicated to the Electricity Consultative Council. It is proposed that the new tariffs shall become operative as from the meter readings following 1st November next.

Improved North Cheshire Supply

Built by the North Western Electricity Board to deal with the steadily increasing demand in North Cheshire, a new substation at Broadheath, Altrincham, will eventually be directly connected with the 275 kV supergrid network via Carrington generating station. The new substation, which was commissioned on 11th August, is the culmination of four years' planning and construction which has involved the building by the B.E.A. North Western Division not only of a new 132 kV transformer station but also the erection of 132 kV lines from Broadheath and Sale to link up with the grid at Carrington.



New high voltage substation at Broadheath, Altrincham, opened by the Mayor on 11th August

The switch-on of the Broadheath substation means that Altrincham and North Cheshire are now being fed directly from the 132 kV grid. Hitherto, they had been supplied from a switching station in Wood Lane, Timperley, linked with the extensive 33 kV Cheshire ring, which supplies Knutsford, Alderley Edge, Macclesfield and Marple from Stockport generating station. The new substation incorporates the existing substation at Broadheath, which took a supply from Stockport. It will have a direct link with Carrington generating station, where the first set is expected to be in operation within a few weeks.

Commissioning of the new substation has called for extensive reorganization of existing supply

arrangements. The two 33 kV cables between Wood Lane and Broadheath are now being used in reverse, so that Wood Lane switch-house is being fed from the new substation. The two 33 kV overhead lines which were used to feed Wood Lane from Stockport are being diverted from Stockport and used to supply Cheadle, while the 33 kV overhead line which ran from Wood Lane to Knutsford will in future be diverted from Knutsford to feed Manchester's new industrial estate at Moss Nook.

New Power Stations

The British Electricity Authority has received the consent of the Minister of Fuel and Power to the establishment of a new power station at South Denes, Great Yarmouth, to be known as South Denes power station. It will have an installed capacity of 240 MW, made up of four 60 MW turbo-generators each served by a boiler unit having an evaporative capacity of 550,000 lb/hr.

Two new electricity power stations to be built near Rugeley will cost about £32,500,000. The site adjoins the new Lea Hall colliery at Brereton, now in course of construction.

Saskatchewan Scheme

" Unqualified support " for the South Saskatchewan River power and irrigation project has been pledged by Mr. George Drew, leader of the Progressive Conservative Party. The plan to irrigate more than 600,000 acres in the dry Palliser Triangle—dust bowl of the drought years in the 1930's—and provide hydro-electric power was described by Mr. Drew as " one of the greatest projects of its kind in Canada."

Generation in July

Though less than in June, the rate of increase in electricity generated last month was above the average for the year, at 9·3 per cent. The monthly figures published by the Ministry of Fuel and Power (see table) show that 4,489 million kWh was generated by the British Electricity Authority and the North of Scotland Hydro-Electric Board. Water power output so far this year is well below last year's level, but in July there was a rise in the output of the B.E.A.'s hydro-electric plant to 26 million kWh from 11 million kWh in June.

During the month there was an increase of 109 MW in generating plant installed, making the aggregate capacity 18,075 MW.

The following new plant was commissioned in B.E.A. stations last month:—East Yelland: One 30 MW Parsons set. Staythorpe: 240,000 lb/hr Babcock & Wilcox boiler. Nechells: 230,000 lb/hr International Combustion boiler. North Tees: 360,000 lb/hr B. & W. boiler.

Belfast Breakdown Investigation

Reporting to the Belfast Electricity Committee on 10th August the acting city electrical engineer, Mr. R. P. Watson, stated that examination of the plant at the Harbour power station following the breakdown which occurred during the visit of Queen Elizabeth and the Duke of Edinburgh on 2nd July had disclosed no evidence of sabotage. The manufacturers had described the occurrence of the failure when it did as " a remarkable coincidence." The breakdown could most probably be attributed to an insulation failure in the 33 kV busbar supports. Extensive examination and tests had not revealed any other insulation weaknesses.

Congo Power Scheme

The *Daily Telegraph* reports that the Belgian Colonial Council has approved a proposed contract by which electric power will be sold in bulk from the Belgian Congo to the Rhodesia Congo Border Power Corporation for use in the mines of the Rhodesian Copperbelt. Supplies are not expected to begin until 1957, when the new power station of Union Minière du Haut Katanga is completed. This will bring Union Minière generating capacity up to 2,250 million kWh per annum. It should then yield a surplus available for export until various schemes for the use of water-power on the Rhodesian side of the border have had time to bear fruit.

ELECTRICITY GENERATED AND CAPACITY OF PLANT INSTALLED

	Fuel consumed Thousand tons			kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Coke and Breeze	Oil	Steam	Water power	Total*		
British Electricity Authority ..	2,422	62	5·5	4,374	26	4,408	4,130	17,510
North of Scotland H.E.B. ..	19	1	1·2	29	48	81	80	565
Total for July, 1953	2,441	63	6·7	4,403	74	4,189	4,210	18,075
Corresponding total for July, 1952	2,294	62	4·4	4,034	63	4,108	3,855	16,661
Increase or decrease, per cent ..	+6·4	+1·6	+52·3	+9·1	+17·5	+9·3	+9·2	+8·5
Total to date (7 months), 1953 ..	20,593	538	47·2	36,954	594	37,644	35,417	
Total for corresponding months of 1952	19,608	477	39·8	34,362	722	35,174	33,136	
Increase or decrease, per cent ..	+5·0	+12·8	+18·6	+7·5	−17·7	+7·0	+6·9	

* The total includes 7·0 million kWh generated by oil engines and 5·1 million by waste heat plants in July.

The Nature of Power Stations

Fine Art Commission's Opinions

VIEWS on the subject of power station design are expressed in the 1952 Report of the Royal Fine Art Commission (Cmd. 8888, H.M. Stationery Office, 6d). The Commission says:—

> "Among the building projects that have come before the Commission we would mention two classes in particular, conspicuous both by their bulk and their practical importance—office blocks on the one hand, power stations and gas works on the other. In spite of obvious radical differences they have one problem in common. Their colossal size suggests a monumentality traditionally reserved for buildings of religious or other civic purpose. Neither office buildings nor power stations can claim high significance on an emotional plane and to 'monumentalise' them is to debase the currency of architectural values and to incur the risk of rendering themselves ridiculous. In most cases where these exceptionally large buildings are required, whether for routine administration or for housing equipment and machinery, the desire for monumentality should, in the Commission's opinion, be strongly resisted."

After some comments upon the construction of large office blocks the Commission goes on to say:—

> "In the case of power stations or gas works, a straightforward expression of the practical requirements is usually æsthetically the best. In this respect the Commission has noted continued improvement in the standard design of power stations, and this improvement is associated with the more general employment of architects. The problem of gas works is more difficult, but the Commission, with the help of the Gas Council, is trying to get a similar policy adopted for them."

Another matter dealt with in the report is the design of "street furniture"—a term which includes lighting standards. The Commission is now consulted in all cases where, in its opinion, improved lighting on trunk roads is likely to affect the architectural character of any particular town or village on the route. The problem is said to be largely one of scale, and the possibility of reducing the mounting height of lamps below the standard 25ft is being discussed. In addition, the "massiveness" of many types of modern lamp standards makes them inappropriate for the older towns and villages. In a number of cases the Commission has pressed for the adoption of a less obtrusive type, even if this has sometimes meant a special allocation of steel for the purpose.

Similar consultations have continued where improved lighting has been required over bridges of architectural interest and in several cases the local authority has agreed to provide specially designed equipment.

Judgment was passed on seventeen street lighting schemes in many parts of the country, and the Commission also had under its notice the North Wales hydro-electric development and the Castle Donington, Ferrybridge "B," Greenwich (London Transport), Hams Hall "C," Ince, Meaford "B," Northampton and Wakefield power stations.

B.S.I. Report

THE annual report (general section) of the British Standards Institution shows that during the year 1952–53 there has been an expansion of the volume and scope of the Institution's work, with a continued improvement in the speed of consideration of individual projects. During the year subscriptions increased from £95,026 to £106,767; other payments from industry and trade by way of certification mark fees, etc., amounted to £16,096. The Government grant was £100,000 and sales of publications reached a new high level at £85,498 as compared with the previous highest figure of £63,781 in the preceding year.

The subscribing membership rose by 423 to 7,836 and 162 new committees were set up, 21 existing committees reconstituted, 129 committees disbanded and the representation of many organizations on B.S.I. committees reviewed. The number of standing committees is 2,318 and committee membership is 13,799. The number of new and revised specifications issued was 260 (170 new and 90 revised) compared with 227 the previous year (159 new and 68 revised).

Financial Section

STOCKS and SHARES

THE lull in business during the holiday season presents an opportunity to take stock of the position which has developed in Stock Exchange markets since the start of the year. Broadly speaking, an interesting tendency has been for gilt-edged securities to hold, for much of the time, some ascendency over industrial shares. With confidence hardening in the country's financial position, the improvement in Government issues is reflected in appreciation of about 3 per cent in the four British Electricity stocks. Industrials, on the average, have also gained ground, although a good deal of irregularity has developed at times on the evidence of lower company earnings in some industries, and on the uncertainties presented by changes in the industrial situation. In the tables below, adjustments are made for capital bonuses, but not for cash issues.

Cables and Telephones

The experience of shares in the cable manufacturing group has been a little uneven, but in many cases quotations are standing higher than they did at the beginning of the year. The telephone manufacturing section has been comparatively subdued.

Share	2nd Jan.	17th Aug.	Change
B.I.C.C.	34/–	36/6	+ 2/6
Enfield	22/–	21/3	– 9d
Henley's	19/–	17/–	– 2/–
J. & P.	52/–	52/6	+ 6d
London Elec. Wire	51/3	60/–	+ 8/9
Scottish Cable ..	11/3	12/6	+ 1/3
Siemens	34/6	34/–	– 6d
Telegraph Constr...	26/–	29/–	+ 3/–
Auto. Telephone ..	60/–	58/–	– 2/–
Ericsson	41/6	38/6	– 3/–

Electrical Equipment

Electrical engineering shares, especially those connected with the capital equipment branches of the industry, have continued to retain the investor's confidence more surely than have many other sections of the industrial market. Dividends paid in respect of 1952 were generally satisfactory, and most of the net price changes have been well in favour of shareholders.

Share	2nd Jan.	17th Aug.	Change
A.E.I.	75/–	78/9	+ 3/9
Brush	4/9	4/3	– 6d
Crabtree Elec. ..	31/3	29/–	– 2/3
Crompton P. ..	8/9	10/9	+ 2/–
Electric Constr. ..	50/–	52/6	+ 2/6
English Electric ..	59/–	52/6	—
General Electric ..	42/6	38/9	– 3/9
Hackbridge & Hewittic ..	16/3	17/9	+ 1/6
Parsons	55/–	71/3	+ 16/3
Reyrolle	51/3	60/–	+ 8/9
Westinghouse ..	50/9	56/3	+ 5/6
Allen West.. ..	10/3	11/3	+ 1/–

Miscellaneous Groups

Some of the lighter branches of electrical manufacturing, and certain sides of heavy engineering, have alike lost favour during the course of this year; but several members of the "radio" group have done particularly well.

Share	2nd Jan.	17th Aug.	Change
Aron	37/6	45/–	+ 7/6
Babcock & W. ..	71/–	66/6	– 4/6
Chloride Elec. ..	65/–	80/–	+ 15/–
E. K. Cole ..	17/–	19/6	+ 2/6
Decca	18/–	28/6	+ 10/6
E.M.I.	13/3	14/6	+ 1/3
Ever Ready ..	26/6	25/6	– 9d
Hoover	23/9	24/3	+ 6d
Lucas	36/3	41/3	+ 5/–
Pye	16/–	19/–	+ 3/–
Tube Inv.	60/3	60/–	– 3d

Brush Electrical

On 3rd September the Brush Electrical Co. is holding a meeting to obtain consent for the issue of 940,000 6 per cent convertible redeemable preference shares at £1 each to holders of the company's ordinary shares. Brush 5½ per cent preference stand about 17s and the ordinary fell to 3s 9d before rallying to 4s 3d on account of the proposed new issue. It is obvious that attractive terms must be given in order that the proposed offer should appeal to Brush proprietors. The inducement of the new preference shares lies in the conversion proposal. The new shares will have the right of converting into ordinary stock, up to 1963, at the rate of four ordinary units of 5s each for every £1 of convertible preference. Holders are to pay 1s premium, in cash, to the company for each 5s unit taken up. The new preference will be redeemable at the company's option at 21s after 1963, with final repayment on 31st December, 2003.

Week's Fluctuations

The rises in prices, as compared with a week ago, greatly outweigh the falls. Most of the improvements are comparatively modest, but the extent to which they are spread over the various groups is distinctly satisfactory from

the point of view of holders of the shares. That there should be so steady an improvement during the holiday month is somewhat surprising, but it illustrates the thinness of markets at the present time, and it demonstrates the promptitude with which prices respond either to a little buying or a little selling. Of late, the selling has been reduced to something of a trickle, with the consequence that every buying order has a strengthening effect frequently beyond what might have been expected from the amount of stock or shares involved.

Company	Dividend Previous	Dividend Last	Middle Price 17th Aug. 1953	Week's Rise or Fall	Est. Yield p.c. £	s	d
Gilt-edged and Overseas Stocks							
Brit. Elec. 1968/73	3	3	88	—	3	8	2
Brit. Elec. 1974/77	3	3	85½xd	—	3	10	2
Brit. Elec. 1976/79	3½	3½	92½	—	3	15	8
Brit. Elec. 1974/79	4½	4½	101½	—	4	3	9
Calcutta Elec. ..	6†	6†	20/-	+6d	6	0	0†
East African Power	7	7	24/6	—	5	14	3
Nigerian Elec. ..	10	10	23/6	+ 1/-	8	10	2
Palestine Elec. "A"	5†	Nil	11/6	—		Nil	
Perak Hydro-Elec.	Nil	Nil	17/-	+2/-		Nil	
Equipment and Manufacturing							
AberdareCables(5/-)	20	25	16/-	—	7	16	4
Aerialite (1/-) ..	83½	88½	8/9	—	10	1	10
Allen, W. H. ..	15	15	45/9	—	6	11	3
Aron Elec. Ord. ..	15	20	45/-	—	8	17	10
Assoc. Elec. Ord...	20	20	78/9	+ ¼	5	1	6
Automatic Tel. & El.	15	15	58/-	+6d	5	3	5
Babcock & Wilcox	18	18	66/6	+1/6	5	8	5
Baldwin, H. J. (2/-)	25	20	4/-	—	10	0	0
Bakelite (10/-) ..	—	12½	19/-	+1/-	6	11	6
British Aluminium	12	12	40/6	+6d	5	18	5
B.I. Callender's ..	9	10	36/6	—	5	9	7
British Thermostat (5/-)	30	35	16/3	—		—	
British Vac. Cleaner (5/-)	25	25	11/6	—	10	17	6
Brook Motors (10/-)	20	20	33/9	—	5	18	6
Brush Ord. (5/-) ..	10	4	4/3	—		—	
A. F. Bulgin (1/-)	30	30	2/9	—	10	18	0
Burco (5/-) ..	38⅛	35	18/3	—	9	13	0
Chloride El. Storage	15	20	80/-	—	5	0	0
Cole, E. K. (5/-) ..	25	25*	19/6	+1/-	6	8	2
Cossor, A. C. (5/-)	Nil	10	10/-	—	5	0	0
Crabtree (10/-) ..	17½	17½	29/-	—	6	0	8
Crompton Parkinson Ord. (5/-) ..	11¼	11¼	10/9	—	5	4	8
De La Rue (5/-) ..	35	Nil	8/9	+3d		—	
Decca (5/-) ..	112½	150	28/6	+2/3	5	5	3*
Dewhurst (2/-) ..	22½	19*	5/6	—	6	18	3
Dictograph Tel.(2/-)	20	20	5/6	—		—	
E.M.I. (10/-) ..	12	12	14/6	+3d	8	5	6
Electrical Components (5/-) ..	20	20	10/-	—	10	0	0
Elec. Construction	15	15	52/6	—	5	14	3
Enfield Cable Ord.	7½	5	21/3	—	4	14	0
English Electric ..	15	15	52/6	—	5	14	3
Ericsson Tel. (5/-)	22†	22*†	38/6	+6d	2	17	6†
Ever Ready (5/-)	35	35	25/6	—	6	17	9
Falk Stadelmann	15	15	42/9	—	7	0	2
G.E.C. Ord. ..	22½	11¼*	38/9	—	5	18	2
General Cables (5/-)	30	30	16/9	+6d	8	19	2
Greenwood & Batley	15	17½	40/-	—	8	15	0
Hackbridge Cable (5/-)	20	20	11/9	—	8	10	2
Hackbridge Hewittic (5/-)	20	20	17/9	+9d	5	12	8
Hall Tel. Acc.(10/-)	10	10	10/-	—	10	0	0
Heatrae (2/-) ..	12½	12½	4/-	—	6	5	0
Henleys (10/-) ..	20	10½*	17/-	—	6	3	6
Holophane (5/-) ..	15	20*	12/6	—	8	0	0
Hoover (5/-) ..	35	25	24/3xd	—	5	3	1

Company	Dividend Previous	Dividend Last	Middle Price 17th Aug. 1953	Week's Rise or Fall	Est. Yield p.c. £	s	d
Equipment and Manufacturing (continued)							
Intl. Combustion (5/-)	25	15*	13/9	—	5	9	0
Johnson & Phillips	15	15	52/6	—	5	14	3
Lancashire Dynamo	12½	12½*	42/6	—	5	17	8
Laurence, Scott(5/-)	15	15	12/3	—	6	2	6
London Elec. Wire	12½	15	60/-	—	5	0	0
J. Lucas	7½	9½	41/3	—	4	8	10
Marryat & S. (2/-)	22½	22½	5/9	—	7	16	6
Mather & Platt ..	12½	15	50/-	+6d	6	0	0
Metal Industries ..	15	12*	40/6	−6d	5	18	5
Mid. Elec. Mfg. ..	15	15	59/6	—	5	0	10
Murex	15	15	55/3	−9d	5	8	6
Newman Ind. (2/-)	10	10	2/3	—	8	17	9
Oldham & Son (1/-)	35	17½*	2/6	—	7	0	0
Parnall (Yate) (5/-)	6	6	4/1½	+1/1½	7	6	4
Parsons, C. A. ..	10*	12½	71/3	+5/-	3	10	6
Plessey (5/-) ..	22½	25	26/3	+6d	4	15	3
Pye Deferred (5/-)	18	20	19/-xd	+9d	5	5	3
Revo (10/-) ..	27½	27½	15/9	—		—	
Reyrolle	10*	12½	60/-	—	4	3	4
Scot. Cable (4/-) ..	32	20*	12/6	—	6	8	0
Siemens Ord. ..	10	10	34/-	+6d	5	17	8
Southern Areas ..	5	6	14/3	—	8	8	6
Strand Elec.(5/-)..	17½	17½	8/3	−6d	10	12	2
Sturtevant (5/-) ..	17½†	18·1*†	24/9	+6d	3	12	9
Switchgear & Cowans (5/-)	22½	22½	14/-	—	8	0	9
Taylor, T. (5/-) ..	20	25	20/-	—	6	5	0
T.C.C. (10/-) ..	20	20*	36/3	—		—	
T.C. & M... ..	10	8½*	29/-	+6d	5	17	3
Telephone Mfg.(5/-)	10	10	7/6	—	6	13	4
Thorn. Elec. (5/-)	10	12½	11/-	+6d	5	13	8
Tube Investments	25	15*	60/-	—	5	0	0
Vactric (5/-) ..	Nil	Nil	7/6	—		Nil	
Veritys (5/-) ..	7½	10	4/6	—	11	2	2
Walsall Conduits (4/-)	70	70*	44/6	—	6	5	10
Ward & Goldstone (5/-)	45	45*	38/-	—	5	18	9
Watford (2/-) ..	25	25	7/-	—	7	2	10
Westinghouse Brake	14	15	57/6	+ ¼	5	4	2
West, Allen (5/-) ..	15	15	11/3	—	6	13	4
Trusts, Transport and Communications							
Anglo-Am. Tel.: A Ord.	—	6	84½	—	7	2	0
Ord.	—	3½	57½	—	6	10	5
Anglo-Portuguese	8	8	21/3	—	7	10	7
Brit. Elec. Traction: Def. Ord. (5/-) ..	25	35	29/3	—	5	19	8
Cable & Wireless: Ord.	8	8	133	−2	6	0	4
4% Loan ..	4	4	96	—	4	3	4
Calcutta Trams ..	6†	6†	20/-	−6d	6	0	0†
Cape Elec. Trams	5	5½	10/-	+6d	11	0	0
Marconi Marine ..	10	10	28/6	+6d	7	0	4
Oriental Tel. Ord.	16	16	70/6	+6d		—	
Telephone Props.	8	8	5½xd	—	1	15	6
Tele. Rentals (5/-)	10	10*	9/-	—	5	11	0

* After capital bonus. † Dividends are paid free of income tax.

The above quotations are based upon the middle prices given in the Stock Exchange Daily Official List

REPORTS and DIVIDENDS

The Brush Electrical Engineering Co., Ltd., proposes to raise approximately £914,000 net by an issue of 940,000 6 per cent £1 cumulative convertible redeemable preference shares at par. Consent of the Capital Issues Committee has been obtained. These shares will be offered to ordinary stockholders registered on 10th August. An extraordinary meeting is called for 3rd September to sanction the issue. The new preference will rank after the existing £1,660,000 5½ per cent issue. Holders will have the option to convert on any 30th June or 31st December up to end-1963 into ordinary stock at the rate of four 5s ordinary for each £1 preference, plus a conversion premium in cash of 1s for each 5s ordinary taken up. On the expiration of the conversion option, the shares will be redeemable at 21s with an ultimate redemption date at end-2003. Messrs. Rowe and Pitman have undertaken to subscribe for the whole of the new issue for a commission of 6d a share, but the Brush ordinary stockholders will be able to subscribe for the shares if they so wish. The issue of the new capital will have the effect of raising the board's borrowing powers by a further £1,880,000 but, it is stated, there is no present intention to seek additional facilities to that extent. The board considers that with the additional facilities which the bankers have agreed to make available and the proceeds of the issue, the company will have adequate funds for current requirements.

Telephone Properties, Ltd.—This company's 1952 results were briefly mentioned in the *Electrical Review* of 7th August. In the speech which he is to present at the annual meeting on 1st September, the chairman (Sir Alexander Roger) refers to the Venezuelan oil industry and to the Government's realization that it is necessary to develop the country's other resources—iron ore, sulphur, magnesia, manganese, etc. He also mentions the country's need of the better roads and railways now being constructed. Discussions have been proceeding with the Government upon the expansion of the Nacional Telephone Company. Their British interests submitted technical and engineering plans for carrying out this expansion and an independent American report was presented. Financial plans for the supply of the necessary plant and equipment by British interests were well advanced, but in the end the Venezuelan authorities preferred to place the contracts with European firms. At the same time they expressed a desire to purchase the ordinary shares of the Nacional Company. The ordinary shares entitle the holders to 96 per cent of the voting rights; they are held as to 83 per cent by Telephone Properties and the other 17 per cent by associated British companies. Two directors have been in Venezuela for several months but so far no contract has been signed.

Gabriel, Wade & English, Ltd., report group trading profits for the year ended 31st May last amounting to £442,014. The corresponding figure for 1951-52, £459,882, includes a transfer from provisions no longer required. The net profit was £404,723 (£421,612), before providing for taxation amounting to £200,725 (£209,773). The balance of profit attributable to the parent company, after providing for taxation, was £189,418 (£189,856), to which was added £68,539 (nil) provision for taxation no longer required. It is proposed to maintain the ordinary dividend at 10 per cent, but to increase the bonus from 5 to 7½ per cent. The carry-forward is increased from £156,938 to £167,688.

Ruston & Hornsby, Ltd.—The accounts for 1952-53 were dealt with in our issue of 24th July. The chairman's address to be delivered at the annual meeting on 2nd September is contained with the directors' report in a handsome colour-illustrated brochure. Mr. W. J. Ruston says that the retention of markets has become a national problem and allied with it is the question of costs in the face of growing competition, particularly from Germany and Japan. Wages and other costs are out of the company's control but they are doing all they can to regulate such costs as are under their control.

Phoenix Telephone & Electric Holdings, Ltd., record a group net profit, after taxation, of £48,709 for the year ended 28th February, compared with £44,787 for the previous twelve months. A sum of £20,210 (nil) is absorbed by goodwill of subsidiaries written off, while general reserve of a subsidiary receives £7,500 (£35,000). The ordinary dividend is maintained at 10 per cent on the capital raised from £150,000 to £197,500 by an issue of shares for cash. The carry-forward is increased from £10,895 to £11,246.

London Electrical & General Trust, Ltd.—After providing £32,686 for taxation (compared with £29,677) the net revenue for the year ended 30th June was £38,728 (£34,845). It is proposed to pay a final ordinary dividend of 9½ per cent (5½ per cent), making a total distribution of 12½ per cent (8 per cent).

Pinchin Johnson & Associates, Ltd., report consolidated profits for the year ended 31st March for the parent company, and for periods between 31st August and 31st December for subsidiaries, amounting to £1,476,076 (£1,958,819). The net profit was £538,241 (£697,194). It is proposed to pay a dividend of 20 per cent (25 per cent) and to carry forward £818,744 (£743,908).

The Nico Light Engineering Co., Ltd., is again to pay a dividend of 10 per cent with a bonus of 10 per cent. The net profit, after taxation, was £10,473 for the year ended 31st March, compared with £13,308 for the previous year. No allocation is made to reserves (as against £8,000) and £11,598 (£7,079) is carried forward.

The Britannia Electric Lamp Works, Ltd., after charging £67,910 (£64,873) for taxation, shows group net profits amounting to £24,374 for the year ended 31st March, compared with £38,745 in the previous twelve months. A dividend of 12½ per cent (same) is to be paid.

New Companies

Beam-Echo, Ltd.—Registered 4th August. Capital £10,000. Electrical and electronic engineers, etc. Directors : P. C. Hounsfield and H. M. Rahmer. Secretary : J. W. Madden. Regd. office : Coventry House, 3, South Place, E.C.2.

Hendry & Hawkins (Electronics), Ltd.—Registered 20th July. Capital £2,000. Electrical engineers, etc. Directors : R. R. Hendry and L. A. Hawkins. Regd. office : 11/13, Batterdale, Hatfield.

E.M.D. (Romford), Ltd.—Registered 4th August. Capital £5,000. Manufacturers, manufacturers' agents or distributors of electrical plant, equipment and fittings, electrical factory equipment, etc. Permanent directors : H. Leek and Esther W. Leek (secretary). Regd. office : 49/51, St. Andrew's Road, Romford, Essex.

Geo. Moxon (Electrical), Ltd.—Registered 8th August. Capital £10,000. Electricians, electrical and mechanical engineers, etc. Directors : J. A. Connor (chairman), G. Moxon, M. J. Connor and J. E. Moxon. Secretary : Flora M. Baxter. Regd. office : Neale Road, Wheatley Park Industrial Estate, Doncaster.

Marinair (Radar), Ltd.—Registered 8th August. Capital £2,000. Radar engineers, television engineers and contractors, electronic engineers, etc. Directors : Lt.-Comdr. C. W. Green, Lt.-Comdr. (L.), A. H. McAuley (secretary) and L. A. Shaw. Regd. office : St. Ann's Wharf, 314, Burdett Road, E.14.

W. J. Thompson (Optical), Ltd.—Registered 8th August. Capital £1,000. Electrical and electronic engineers and contractors, wire drawers, optical engineers, etc. Directors : W. J. Thompson (secretary) and W. J. Thompson, jnr. Regd. office : 28, Mackenzie Street, Slough, Bucks.

Alex Owen, Ltd.—Registered 30th July. Capital £3,000. To acquire the business of a wireless, television, electrical, motor and refrigeration engineer carried on by Alexander Owen at Chilwell, Notts. Directors : A. Owen (chairman) and Mrs. Marion Owen. Regd. office : 161, High Road, Chilwell, Notts.

Receiver Released

B. & B. Batteries, Ltd.—F. Goodman, 3, Broad Street Buildings, E.C.2, ceased to act as receiver and manager on 1st July.

Winding-up Petition

Electrical General Assemblies, Ltd.—A petition for the winding-up of the company will be heard at the Royal Courts of Justice, Strand, London, on 5th October. Anyone intending to appear on the hearing must write before 3rd October to Hyde, Mahon and Pascall, solicitors, 33, Ely Place, Holborn, London, E.C.1.

Liquidation

P. A. Robinson (Electrical) Co., Ltd.—Meeting of creditors on 25th September at 25, Bedford Row, London, W.C.1, to receive an account of the winding-up by the liquidator, Mr. R. A. Rodgers.

Bankruptcies

S. A. Cooper, electrical engineer, 17, St. Margaret's Road, St. Marychurch, Torquay.—Order made 14th April refusing discharge.

K. J. Ward, lately residing and carrying on business at "Howard," Trusthorpe Road, Sutton-on-Sea, Lincolnshire, as an electrical contractor.—Last day for receiving proofs for dividend 25th August. Trustee, Mr. C. T. Newman, 53-61, York Terrace, Regent's Park, London, N.W.1.

M. K. Matthews, radio engineer, 150, Cranes Park Road, Sheldon, Birmingham.—First and final dividend of 20s in the £ payable at the Official Receiver's office, Somerset House, 37, Temple Street, Birmingham, 2.

L. J. Quick, electrical distributor, 5, Brentside Close, Ealing, W.13.—First dividend of 3s 6d in the £ payable 25th August at 25, Bedford Row, London, W.C.1.

G. F. Jenkins, electrician, 24, Browning Road, Enfield, Middlesex.—First and final dividend of 1d in the £ payable 25th August at the Official Receiver's office.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 30th September from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1949

7319. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Circuits embodying cathode-ray tubes. 17th March, 1949. (697642.)

10538. Cathodeon, Ltd., and Theile, R.—Apparatus incorporating a video storage tube, and method of operating same. 5th April, 1950. (697722.)

21191. France, H. G. M. De.—Television devices. 15th August, 1949. (697645.)

22348. Veritys, Ltd., and Forth, J. W.—Fluorescent electric lighting fittings. 27th November, 1950. (697902.

23732. Postmaster General.—Systems for the transmission of telegraph signals. 4th October, 1951. (697782.

24509. Telerection, Ltd., and Durant, E. W.—Aeria systems. 27th December, 1950. (697842.)

27592. Soc. Anon. pour les Applications de l'Electricité et des Gaz Rares-Etablissements Claude Paz et Silva.—Electric discharge device. 27th October, 1949. (697903.)

1950

2448. Electric & Musical Industries, Ltd.—Power-driven wringers. 31st January, 1951. (697649.)

4167. B.V.C. Electronic Developments, Ltd., and Briggs, G.—Electrical time delay devices. 17th May, 1951. (697907.)

8251. Eastman Kodak Co.—Apparatus for electronic vacuum tubes and the like. 3rd April, 1950. (697790.)

9267. Beer, D. C.—Snap-action electric switches. 16th July, 1951. (697729.)

11590. Automatic Telephone & Electric Co., Ltd.—Telephone instruments. 4th May, 1951. (697731.)

11723. Fisher, W. G.—Combined electric switch-and-socket units. 9th May, 1951. (697654.)

12907. Soc. des Moteurs Leroy.—Electric motor frames and to the manufacture thereof. 23rd May, 1950. (697658.)

14112. British Thomson-Houston Co., Ltd., and Kinman, T. H.—Utilization of the photo-electric effect in semi-conductors. 29th June, 1951. (697851.)

21982. British Telecommunications Research, Ltd.—Cam-operated devices for controlling electric circuits. 27th August, 1951. (697913.)

27136. Cole, Ltd., E. K., Kemp, R., and Chapman, C.—Tuning device for radio receiver. 7th November, 1951. (697666.)

30870. Sarazin, J. L., Sarazin, S. A., and Moneyron, M.—Electric arc welding of bolts, studs and the like. 19th December, 1950. (697671.)

31023. Western Electric Co., Inc.—Compositions suitable for filling electrical apparatus. 20th December, 1950. (697805.)

31277. Soc. Financière d'Expansion Commerciale et Industrielle Soc. Anon. Sfindex.—Apparatus for the electrostatic precipitation of solid and liquid particles from a gas-flow. 22nd December, 1950. (697918.)

1951

717. Western Electric Co., Inc.—Digital information transmission systems. 10th January, 1951. (697744.)

1783. Automatic Telephone & Electric Co., Ltd.—Temperature control arrangements incorporating electrical bridge circuits. 15th January, 1952. (697675.)

2643. Western Electric Co., Inc.—Selective signalling systems employing pulse code-modulated carrier signals. 2nd February, 1951. (697920.)

2874. Nekolny, K. F. R., Konig, F., and Mueller, E. O.—Apparatus for producing high-frequency oscillations in liquids. 6th February, 1951. (697860.)

4682. Self-Priming Pump & Engineering Co., Ltd., Meredew, G. C., and Stevens, G. C.—Electric motor driven pumps. 13th September, 1951. (697749.)

5039. Compagnie G n rale de T l graphie sans Fil.—Electron and iron discharge tubes. 1st March, 1951. (697922.)

5418. Associated Electrical Industries, Ltd.—Magnetic electron lenses. 26th February, 1952. (697923.)

6917. British Electrical & Allied Industries Research Association.—Protective apparatus for direct current transmission lines employing valve convertors. 12th March, 1952. (697813.)

9202. Anti-Attrition Metal Co., Ltd., and Livingstone, R.—Carbon holders or shoes for electric current collectors. 11th February, 1952. (697754.)

12339. Vigren, S. D., Broberg, W. O. W., and Zander, R. A.—Electromagnetic relays and similar switching devices. 25th May, 1951. (697758.)

13908. Brennan, J. B.—Electrolytic devices. 12th June, 1951. (697876.)

14448. Metropolitan-Vickers Electrical Co., Ltd.—Electric peak voltage measuring circuits. 17th June, 1952. (697879.)

15125. Western Electric Co., Inc.—Electric circuits including semi-conductor devices. 26th June, 1951. (697880.)

15935. Hill, T.—Portable electric lights. 24th June, 1952. (697760.)

15988. Hazeltine Corporation.—Automatic control apparatus for television receivers. 5th July, 1951. (697820.) 15989. Control apparatus for television receivers. (697821.)

16637. Allmanna Svenska Elektriska Aktiebolaget.—Valve arrangement in air-blast electric circuit breakers. 13th July, 1951. (697694.)

16960. Industrial Distributors (1946), Ltd.—Electrostatic separation processes. 17th July, 1951. (697932.)

17993. Metropolitan-Vickers Electrical Co., Ltd.—Electric-discharge apparatus. 18th February, 1952. (697823.)

18321. France, H. G. M. de.—Television systems. 15th August, 1949. (697695.) 18322. Colour television systems. (697696.)

18442 & 4. Hazeltine Corporation.—Signal-translating system for a television receiver. 3rd August, 1951. (697825/6.)

21956. Philips Electrical Industries, Ltd.—Triodes for operation at ultra-high and super frequencies. 19th September, 1951. (697829.)

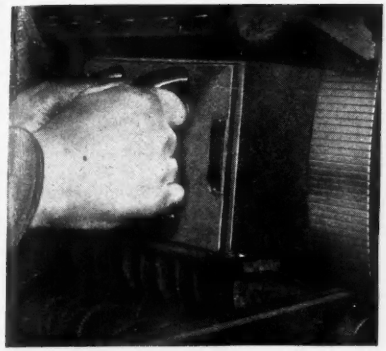
24331. Philips Electrical Industries, Ltd.—Luminescent materials. 18th October, 1951. (697938.)

25671. Creed & Co., Ltd.—Facsimile telegraph systems. 9th May, 1952. (697887.)

25675. Philips Electrical Industries, Ltd.—Apparatus for and methods of registering pulses. 2ndNovember, 1951. (697888.)

25793. Redmond Co., Inc.—Electrically-driven windshield wipers. 5th November, 1951. (697772.)

26757. Babcock & Wilcox, Ltd.—Tubulous vapour generators. 15th November, 1951. (697890.)



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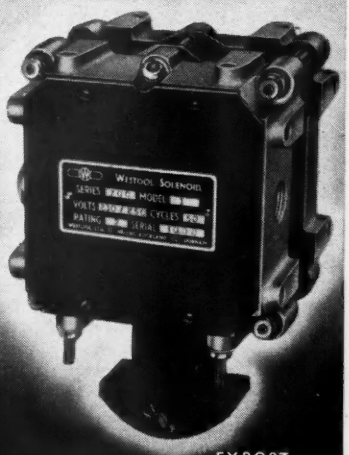

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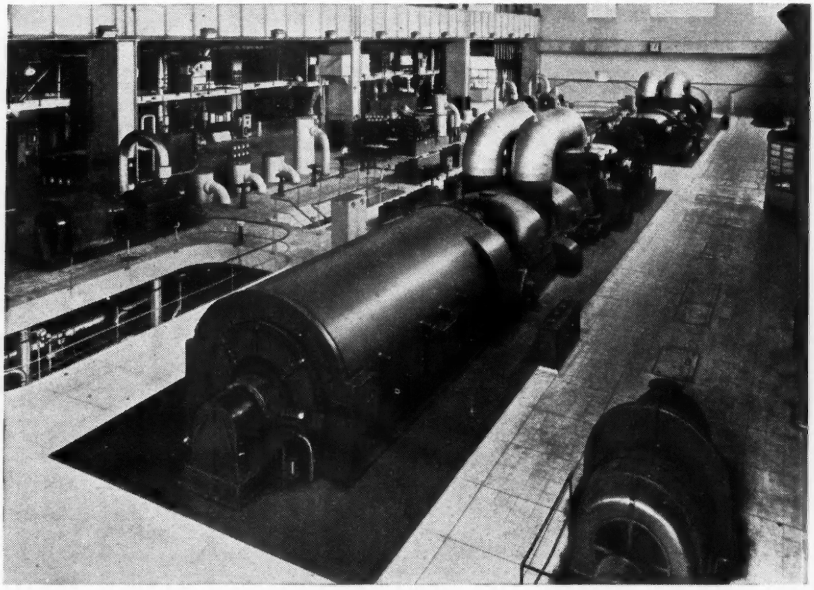

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Engineering in Europe

Survey of Current Literature

THE theory of the losses due to rain drops captured by overhead lines and emitting ions was given by Pauthenier, who showed that the process was a very rapid one, the theoretical results being confirmed by observations. The capture of fog particles, however, is not such a simple phenomenon, because these particles are smaller and can form droplets by aggregation only when deposited on the conductors; also, this process depends on the surface conditions of the conductor. If the conductor is smooth and slightly greasy, it does not "wet" and then droplets are formed; if the conductor surface is rough, a coherent water film is formed and only the excess water produces hanging drops along the lower surface of the conductor cylinder. The final result, i.e., emission of ions, is the same in both cases.

The author presents various analytical and graphical methods for determining the coefficient of capture by a charged cylindrical conductor for the d.c. case. For stationary fogs this theory could be verified experimentally by photographing droplet trajectories. The effect of a rising voltage on the capture of droplets from moving fogs increases at first with the speed of the fog, and then falls to a negligible value. It was also possible to determine experimentally the loss current due to the ions emitted by droplets on a conductor surface as a function of the quantity of water captured. The minimum quantity of water required for the formation of drops capable of emitting ions is usually captured within a few minutes.—"Capture of Fog Droplets by H.V. Transmission Lines," R. Cochet, *R.G.E.*, Vol. 62, pp. 113–129, March, 1953, in French.

Load Balancing

Single-phase loads in three-phase systems may in some cases be balanced by other similar loads, or even by rotating phase-balancing machines (American practice) if the single-phase power is large enough to justify such installations. However, in the fairly frequent case of a single welding machine with three-phase supply, the only economic solution is balancing by three fixed reactances connected in star or delta.

The author determines theoretically the limits of the load variation within which such balancing is possible and shows that (if cos ϕ is compensated to unity) a correctly determined delta circuit of reactances reduces the losses in the lines increasingly with increasing load, so long as the load does not fall below half the value corresponding to equilibrium. Star-connected reactances are less favourable and can be used only in cases where the terminal voltage of the load may rise simultaneously with the load impedance (which applies, e.g., to arc-welding equipment). The analytical results may conveniently be represented by performance charts. The author shows also that the use of static three-phase–single-phase transformers not only leaves the unbalance conditions completely unchanged, but also increases the losses in the lines.—"Balancing of a Variable Single-Phase Load in a Three-Phase System by Fixed Reactances," D. Genkin, *R.G.E.*, Vol. 62, No. 4, pp. 198–210, April, 1953, in French.

Breaking Surges

A report has been compiled for and on behalf of the Swiss Electrotechnical Committee and the A.S.E. on oscillographic measurements of switching surges, carried out partly by the committees concerned and partly by the Swiss circuit breaker manufacturers in testing stations abroad (Austria, France, Sweden and the United States). The types involved were oil circuit breakers, orthojector and air-blast breakers. The tabulated results show that breaking surges are greater in the case of idling transformers than of lines (overvoltage factors up to 6·05 as against 2·5 for lines) and are mostly due to premature quenching of the arc before the current zero. In this respect,

rapid re-ignition is desirable to reduce the overvoltages. A very powerful system has also a mitigating effect on the overvoltages.

On the other hand, where idling lines have to be cut out, the prevention of re-ignition is important, because this represents quite a different case in which the surges result from oscillations between the supply system and the open line at the instant of restriking of the arc in the breaker. The amplitude of these oscillations is determined by the difference of the voltages at either side of the breaker at the instant of re-ignition, one of which is the system voltage and the other that of the still charged line capacitance. This difference is at its maximum half-way between two current zeros of the charging current. At any rate, these surges are comparatively small and easily controlled. The transformer switching surges (small inductive currents) are best controlled by resistance switching.—" Switching Surges on Disconnecting Idling Transformers and Lines," K. Berger, *A.S.E. Bull.*, Vol. 44, No. 9, pp. 397–409, 2nd May, 1953, in French.

Self-Oscillations in Rectifiers

Investigations have been carried out on a modern single-anode tank-type mercury rectifier unit. Apart from the igniting anode, this type has several holding or excitation anodes near the de-ionizing grid, two control grids and auxiliary electrodes forming a potential divider. The existence of self-oscillations was first established when the unit was supplied with d.c. (invertor condition). The regions in and conditions under which these oscillations are set up could be determined as well as their form, amplitudes and frequencies. The influence of the load current of the main anode on the oscillations in the circuits of the other electrodes was also established.

The same series of experiments was then carried out under rectifier conditions with an a.c. supply through the rectifier transformer and at varying regulating angles. At zero regulating angle and in the invertor condition an increase of the current through the main anodes reduces the duration of the h.f. oscillations set up on the " low excitation anodes " and increases the amplitudes of these oscillations. Under normal rectifier operating conditions the amplitudes of these oscillations are smaller, so that invertor conditions represent the more difficult case from the self-oscillation point of view. It is now established that discontinuities in the VA characteristics of rectifiers correspond to sudden changes in the form and frequency of the self-oscillations. From these discontinuities inferences may be drawn as to the critical ranges of the gas discharge and the phase transitions occurring within these ranges.—" Self-Oscillations in a H.V. Rectifier Unit," M. M. Chetverikova, *Elektrichestvo*, No. 4, pp. 35–38, 1953, in Russian.

Contact Wear

The wear of contacts depends on a large number of heterogeneous factors, mechanical, electrical and metallurgical in character, and it is found difficult to isolate any of these factors completely. However, with an experimental breaker permitting a variation of the opening and closing speeds it was possible to establish that there is a wear minimum at a certain opening speed as well as at a differing closing speed.

" Contact speed " itself has to be defined unambiguously for the purposes of such an investigation, it being most convenient to consider, for instance, as " opening " speed the instantaneous speed when the current is actually broken. On the other hand, the " wear " is usually measured by the weight loss of the contacts during a certain number of duty cycles up to the breaker's becoming unserviceable by increased residual resistance, insufficient contact pressure and, therefore, inadmissible temperature rise. There is also a relation between contact-opening speed and arc energy.

The influences of contact bounce and oscillations on circuit breaker operation and contact wear are also well-known. Wear is much higher in circuit-breaking than in circuit-making, as would be expected and, generally, circuit breakers operate at speeds much higher than those corresponding to minimum wear. This is obviously due to the fact that the contact speed has to be determined more from considerations of satisfactory electrical and mechanical performance of the breaker than of the service life of its contacts.—" The Influence of Contact Speed on Contact Wear in A.C. Circuit Breaking," M. G. Diehl, *Electro-Techniek*, Vol. 31, No. 11, pp. 189–191, 21st May, 1953, in Dutch.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia. — MELBOURNE. — 25th August. State Electricity Trust of South Australia. Two 500 kVA, five 100 kVA, five 50 kVA and ten 30 kVA three-phase transformers, 11 kV/430 V delta/star. (E.S.B. 844/53. Ten/6853.)* 28th August. Two 11/2·2 kV 500 kVA delta/star three-phase transformers. (E.S.B. 845/53. Ten/6859.)*

Belgium. — BRUSSELS. — 26th August. Belgian Telephone and Telegraph Administration. Telephone equipment. (E.S.B. 616/53. Ten/6865.)*

Birtley (Durham).—31st August. Parish Council. Maintenance of about 540 street lamps. S. Hunt, clerk to the Council.

Downpatrick.—10th September. Northern Ireland Hospitals Authority. Installation of electrical services at Downshire Hospital. Specification from the Authority's chief engineer, 104, University Street, Belfast.

Durham.—County Council. Electrical installations in five police houses in Glenfield Road, Darlington, and four at Hallgarth Lane, Pittington. County architect, Court Lane, Durham.

Ecuador. — 5th September. Riobamba Municipality. Two 2,500 kW turbo-generator groups for the Alao hydro-electric plant. (C.R.E. 24423/53. Ten/6882.)*

Formosa. — TAMSUI. — 10th September. Central Trust of China. Electric welding rods and electric cable. (E.S.B. 909/53. Ten/6879.)* 11th September. Marine main engines and generators. (E.S.B. 910/53. Ten/6887.)* 15th September. Marine auxiliary engine, air compressor, generator, water pump units and auxiliary engine, air compressor units. (E.S.B. 934/53. Ten/6886.)*

Greece. — ATHENS. — 28th August. Social Insurance Institute. Three electro-therapy machines. (E.S.B. 837/53. Ten/6874.)*

India. — DELHI. — 25th August. Directorate General of Supplies and Disposals. Sealed-in accumulator cells, 40 Ah at 10 hr. rate. (E.S.B. 835/53. Ten/6872.)*

Morocco. — TANGIER. — 15th October. Regie des Services de l'Eau et de l'Electricite, Tangier. Ten 100 kVA and ten 150 kVA 5,500/200-115 V double star three-phase transformers. (E.S.B. 379/53. Ten/6854.)*

Newcastle-on-Tyne.—2nd September. City Council. Electrical installations in 1,284 flats at Longbenton. City architect, 18, Cloth Market.

New Zealand.—WELLINGTON.—13th October. State Hydro-Electric Department. Two three-phase, 220 kV, 2,500 MVA circuit breakers and accessories for Otahuhu and Haywards substations. (E.S.B. 1198/53. Ten/6883.)*

South Africa.—JOHANNESBURG.—2nd September. South African Railways. Supply of e.h.v. disconnecting switch insulators. (E.S.B. 973/53. Ten/6876.)* 9th September. Lighting fittings. (E.S.B. 1052/53. Ten/6890.)*

Tangier.—19th September. Electricity and Water Board. High and low voltage cable, pylons, insulators, etc., to service eight 5,500 V transformer stations. (E.S.B. 565/53. Ten/6862.)*

Tyrone.—17th October. County Education Committee. Electrical installations in new grammar and secondary intermediate schools and a school meals building. Plans from the chief education officer, Omagh.

Uruguay. — MONTEVIDEO. — 31st August. Ministerio de Salud Publica. Laboratory equipment including electric stove for sterilizing and drying. (E.S.B. 796/53. Ten/6867.)*

ORDERS PLACED

Birkenhead.—Education Committee. Electrical installation at Prenton Primary School (£3,861).—J. H. Evans.

London.—L.C.C. Accepted. Supply and maintenance of 100 passenger lifts on housing estates (£195,880).—Express Lift Co., Ltd. Electrical installations in schools: — Chisenhole Primary, Bethnal Green (£2,714).—Alexander & Maiden (Electrical Contractors), Ltd.; Archway County Secondary and Duncombe Primary, Islington (£6,399).—Powerlite Electrical Installations, Ltd.; Tabard Primary School, including Bermondsey Men's Institute, Southwark (£3,000). —London Electricity Board.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Birmingham. — Extensions at Bracebridge Street for T. A. Savery & Co., Ltd.; Maddocks & Walford, Ltd., Tyburn Road, Erdington, Birmingham.

Blackrod.—Dwellings (56) for U.D.C.; J. C. Prestwich & Sons, architects, Bradshawgate Chambers, Leigh, Lancs.

Borehamwood. — School at Cowley Hill (£44,260); county architect, County Hall, Hertford.

*Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

Bristol.—Factory, Brislington Trading estate; Sawer & Purves, Myrtle Street.

Dagenham.—Factory, Hainault Industrial Estate; G. D. Ponsford & Son, Ltd., 193, Grove Green Road, E.11.

Guildford.—Factory at Station Meadows estate; Keefe & Lewis, Ltd., Rodborough Buildings, Bridge Street.

Hailsham. — Neurosis unit at Hellingly Hospital (£90,000); South East Metropolitan Regional Hospital Board, London.

Hull.—Three six-storey blocks of flats, Porter Street; city architect.

Jarrow-on-Tyne.—Houses (106) at Perth Avenue and shopping centre in Edinburgh Road; borough engineer, Town Hall.

Keighley. — Houses (42), Calver Avenue; borough architect.

Kidderminster. — Three-bay extension to fire station; L. C. Lomas, county architect, 14, Castle Street, Worcester.

Leamington Spa.—Block of flats and shops on the Whitnash estate; Rayner & Fedeski, architects to T.C., 28, The Parade.

Ledbury.—Houses (27) and flats (16) at Colwall; Pemberton & Bateman, architects to R.D.C., 21, Vine Street, Evesham.

Limavady (Co. Londonderry).—Dwellings (72); Northern Ireland Housing Trust, 12, Hope Street, Belfast.

Litherland.—Houses (68), on Field Lane estate; clerk to U.D.C., Town Hall, Litherland, Liverpool, 21.

London.—CHISWICK.—Block of shops and maisonnettes, High Street; borough engineer.

ISLINGTON.—Dwellings (57), Whadcoat Street; E. C. P. Monson & Partners, architects, 120, Moorgate, E.C.2.

PADDINGTON.—Flats (36), situated between Hall Place and Campbell Street, W.2; W. H. Bentley, town clerk, Town Hall, W.2.

STREATHAM.—Students' hostel at Philippa Fawcett Training College, Leigham Court Road; Hobday & Maynard, architects, 19, Beckenham Grove, Shortlands, Bromley.

Luton.—Houses (42), off Rochester Way; H. C. Janes, Ltd., 183, High Town Road.

Workshops, stores and offices, Airport; borough engineer.

Lytham St. Annes.—Development of large estate at Smithy Lane, providing for 68 houses as first portion of scheme; W. Heap, town clerk, Town Hall.

Manchester.—New shops and office building at Princes Street for Pearl Assurance Co.; J. W. Beaumont & Sons, architects, Danlee Buildings, Spring Gardens, Manchester.

Newcastle-under-Lyme. — Bakery at 32 Ironmarket for J. G. Quinn; Adams & Edwards, architects, 3, Brook Street, Stoke-on-Trent.

Newcastle-on-Tyne. — Proposed county primary school at Fawdon (£35,500); city architect, 18, Cloth Market.

Extra-mural studies department at Barras Bridge for King's College; W. B. Edwards & Partner, architects, 52, Eldon Place, Newcastle.

Newton Aycliffe.—Proposed R.C. church, presbytery and hall, Central Avenue; T. A. Crawford, architect, 80, Borough Road, Middlesbrough.

Northampton. — Pumping station, Mill Road; borough engineer.

Factory, Heathfield Way; Leather & Ferresflex Components, Ltd., Graveley Street, Rushden.

Northumberland. — Proposed grammar school at Killingworth (£138,000); county architect, County Hall, Newcastle-on-Tyne.

Welfare hostel for old people at Wallsend (£33,000); county architect, County Hall, Newcastle-on-Tyne.

Peterlee (Co. Durham).—Flats (93), Chapel Hill, for Peterlee Development Corporation, Shotton Hall, Castle Eden; chief architect.

Fire station (£12,000); county architect, Court Lane, Durham.

Royston (Herts).—Houses and flats (72), as first stage in a larger scheme, for U.D.C.; John Spencer, clerk, Town Hall.

Smethwick.—Extensions to girls' grammar school, Holly Lodge (£48,500); borough surveyor, Council House.

South Shields.—Secondary modern school, Whiteleas; borough architect.

Stevenage.—Junior and infants' schools at Bedwell East (£104,713); county architect, County Hall, Hertford.

Stoke-on-Trent.—Two main buildings, teaching block (four storeys) and workshop block, for College of Ceramics and Pottery; J. R. Piggott, city architect, Kingsway Chambers.

Extensions to works (£27,500); Michelin Tyre Co., Ltd., Boothen Estate.

Wakefield.—R.C. church at Eastmoor estate; Kay & Hartley, architects, 4, Crown Court.

Wallsend.—Old people's hostel (£33,000); county architect, County Hall, Newcastle-on-Tyne.

Walsall.—Second stage of Forest County Secondary school; Lavender, Son & Close, architects, 50, Bradford Street.

Houses (30), at Dartmouth Avenue estate for T.C.; Rock & Downes, Ltd., 115, Walsall Road, Aldridge, Staffs.

Storage and showroom premises, Ablewell Street; Messrs. Nicholls, Glebe Street.

Warrington.—Houses (38), at Parksway, Woolston, for R.D.C.; surveyor.

Wellingborough.—Houses (90), on the Tower estate; R. Kilby, surveyor, Council Offices, Swanspool.

Welton.—Houses (50), at Dunholme; William Saunders & Partners, architects to R.D.C., 24, Castle Gate, Newark-on-Trent.

West Bromwich.—Hostel for 40 elderly people on the Yew Tree estate; H. Schofield, borough surveyor.

Churchfields Secondary Modern School for E.C.; Richard Sheppard & Partners, 15, Bedford Place, London.

Houses (68), at Tanhouse estate, for B.C.; Sir Alfred McAlpine & Son, Ltd., Waterloo Road, Wolverhampton.